J. Hector. Barnes.

Concordia soll ihr Name sein.

THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

ANNUAL MEETINGS OF MEMBERS.

1863, Newcastle. 1864, Bath. 1865, Birmingham. 1866, Nottingham. 1867, Dundee. 1868, Norwich. 1869, Exeter. 1870, Liverpool. 1871, Edinburgh. 1872, Brighton. 1873, Bradford. 1874, London. 1875, Bristol. 1876, Glasgow. 1877, Plymouth. 1878, Dublin. 1879, Sheffield. 1880, Swansea. 1881, York. 1882, Southampton. 1883, Southport.

The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

Presidents:—

1863–4, 1864–5, H. DEANE, F.L.S.; 1865–6, 1866–7, Prof. BENTLEY, M.R.C.S.; 1867–8, 1868–9, D. HANBURY, F.R.S.; 1869–70, 1870–1, W. W. STODDART, F.C.S.; 1871–2, 1872–3, H. B. BRADY, F.R.S.; 1873–4, 1874–5, T. B. GROVES, F.C.S.; 1875–6, 1876–7, Prof. REDWOOD, F.C.S.; 1877–8, 1878–9, G. F. SCHACHT, F.C.S.; 1879–80, W. SOUTHALL, F.L.S.; 1880–81, R. REYNOLDS, F.C.S. 1881–82, 1882–83, Prof. ATTFIELD, Ph.D., F.R.S., etc.

THE YEAR-BOOK OF PHARMACY AND TRANSACTIONS.

The Conference annually presents to members a handsome octavo volume of about 500 pages, containing the proceedings at the yearly meeting, and a report on the progress of pharmacy, or Year-Book, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulæ, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the desk companion of the year, and an invaluable permanent work of reference for every chemist and druggist. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, assistants, or pupils—and obtain as large a number of new members as possible. Alphabetical lists of the names and addresses of subscribers will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or any other Officer or member. The Name and Address of each candidate should be written legibly, and forwarded to "The Secretary," British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C., together with the subscription.

THE ANNUAL SUBSCRIPTION.

The Conference year commences on July 1st, and Annual Subscriptions are due in advance on that date. For Great Britain and Ireland, and for all countries included in Schedule "A" of the Postal Union, the Subscription is Seven Shillings and Sixpence. For other countries the Subscription is Seven Shillings and Sixpence, and in addition the cost of the postage to those countries of a book weighing two imperial pounds.

Remittances may be made by Post Office Order, *crossed "& Co."* made payable to the *British Pharmaceutical Conference*, at the "High Holborn" Post Office, and should be addressed as follows:—"*The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C.*"

To all members who have previously paid the Annual Subscription, the Year-Book, including Transactions, is posted as soon as published in December, and to other members immediately on receipt of the Subscription.

Extra copies of the Year-Book and Transactions for 1873 and subsequent issues, will be sent to members on receipt of Subscription as above, for each additional copy. To non-members, the price is Ten Shillings per volume, exclusive of postage. Volumes previous to 1873 are out of print.

Honorary General Secretaries, { F. BADEN BENGER, F.C.S., Manchester. SIDNEY PLOWMAN, F.I.C., London.

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YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1881, TO JUNE 30,

1882.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

NINETEENTH ANNUAL MEETING

HELD AT

SOUTHAMPTON,

AUGUST, 1882.

LONDON
J. & A. CHURCHILL, 11, NEW BURLINGTON STREET.
MDCCCLXXXII.

YEAR-BOOK OF PHARMACY AND TRANSACTIONS

OF THE

British Pharmaceutical Conference.

1881-82.

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BRITISH PHARMACEUTICAL CONFERENCE.

Inaugural Meeting held at Newcastle-on-Tyne in 1863.

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1868	Norwich	Daniel Hanbury, F.R.S.	R. Fitch, F.G.S. J. Ince, F.L.S. W. W. Stoddart, F.G.S. J. R. Young.	F. Sutton, F.C.S.
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- 1877 to 1883, C. Ekin, F.C.S.

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- 1863 to 1871, Richard Reynolds, F.C.S.
- 1871 to 1883, F. Baden Benger, F.C.S.
- 1880 to 1882, M. Carteighe, F.C.S.
- 1882 to 1883, Sidney Plowman, F.I.C.

THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1883 will be held at Southport, on Tuesday and Wednesday, September 18th and 19th.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from

THE SECRETARY; BRIT. PHARM. CONF.,
17, Bloomsbury Square, London, W.C.

THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 319.

LIST OF CONTENTS.

INTRODUCTION.

The steady progress made within recent years towards a closer knowledge of the constitution of the vegetable alkaloids continues unabated. If the actual synthesis of these bodies remains yet unaccomplished, signs are not wanting which clearly point to an early solution of this interesting problem. The knowledge acquired of the oxidation products and other derivatives of some of the more important organic bases, and of their relation to other well-known combinations, but above all, the successful conversion of some of these bases into others, may be justly regarded as trustworthy indications of the approaching attainment of one of the most cherished objects of modern chemical research. Professor Ladenburg's classical investigations of the mydriatic alkaloids, and those of M. Chastaing and M. Grimaux respecting the complex functions of morphine, may be cited as important steps in this direction. It will be remembered that, a short time ago, the last-named chemist succeeded in effecting the conversion of morphine into codeine, and that this result was brought about by a correct appreciation on his part of the fact that morphine, though a decided base, also partakes of the characters of a phenol. Doubts have since been cast on the identity of codeine thus obtained with that produced direct from opium; but these again are disposed of by Mr. D. B. Dott and Dr. Hesse, whose results fully corroborate M. Grimaux's statements. The phenolic character of morphine is strikingly confirmed by M. Chastaing's recent observation that, by a suitable treatment with nitric acid and subsequent heating with water under pressure, this base can be made to yield trinitrophenol, or picric acid.

In the further course of his investigations upon tropine, Professor

Ladenburg has obtained results strengthening his previous supposition of the existence in this base of an alcoholic hydroxyl group to which may be attributed the exceptional property of forming fresh alkaloids upon treatment of its various organic salts with dilute hydrochloric acid. In addition to this series of artificial alkaloids now known under the name of "*tropeines*," he has succeeded in the production of another series of analogous bases by the action of chlorhydrines upon secondary amines; the latter, like tropine, yielding other basic compounds resembling natural alkaloids in their properties and composition. For these bodies, which perform the double function of an alcohol and an amine, he proposes the name "*alcamines*," and for the basic ethers derived from them that of "*alcameines*." The number of new alkaloids thus brought within the range of possibility appears to be unlimited and to promise a wide field both for chemical and physiological research.

Hyoscine, the alkaloid recently discovered by Professor Ladenburg in the mother-liquor left after the crystallization of hyoscyamine, has been made by him the subject of a further study, with the object of preparing some readily crystallizable salts suitable for medicinal use. He describes a hydriodate and a hydrobromate of this base, both of which he finds to answer well for this purpose. The identity of daturine with hyoscyamine is called in question by M. Pesci, who arrives at the conclusion that the alkaloid of *Datura stramonium* is a body distinct from any of the other mydriatic bases. An improved process for the preparation of pure crystallized hyoscyamine is published by M. Duquesnel.

In an interesting report on xanthine, Dr. E. Fischer confirms the views previously expressed by Strecker respecting the relation of this base to theobromine, and shows that the former may be converted into the latter, and subsequently into caffeine. He first converts the xanthine into a lead compound by precipitating its solution in soda by means of lead acetate. The dried precipitate is heated for twelve hours in a closed tube with methyl iodide, the resulting product then boiled with water, the solution freed from lead by sulphuretted hydrogen, and the filtrate supersaturated with ammonia and evaporated to the point of crystallization. The theobromine thus obtained may then be converted into caffeine by

Strecker's method. It follows from these researches that, while theobromine may be regarded as dimethyl-xanthine, caffeine appears to be the trimethyl-derivative of the same base.

Mr. E. Jahns opposes Schützenberger's supposition of the existence of several distinct alkaloids in commercial strychnine, and demonstrates that the different forms of crystals obtained by fractional precipitation of the base from solutions of its salts by ammonia, do not warrant such a conclusion, but admit of a much simpler explanation. For the extraction of strychnine from aqueous solutions in analytical operations, Mr. A. H. Allen suggests the use of a mixture of equal volumes of chloroform and ether as a solvent of the freshly precipitated alkaloid, as such a mixture separates much more readily from water than chloroform alone. The sulphates of strychnine form the subject of a report by Dr. C. Rammelsberg.

Mr. F. Skalweit calls attention to the curious fact that the addition of water to nicotine causes a diminution in volume, with a corresponding increase in the specific gravity of the solution, until a certain limit is reached, and accounts in this way for the very discordant statements of different authors relative to the density of this base. The same peculiarity appears to be shared by conine. Mr. J. Schorm describes two new processes for extracting the last-named alkaloid from hemlock fruits, by which he has obtained a larger yield and a purer product than by the usual methods. Hydroxypicoline, an artificial volatile base recently obtained by M. Etard by the slow distillation of a mixture of ammonium chloride and glycerol, proves to be homologous with pelletierine, the alkaloid isolated by M. Tanret from pomegranate bark.

The results of an examination of commercial specimens of pilocarpine and its salts, made by Mr. A. Christensen in the laboratory of the Dorpat Pharmaceutical Institute, tend to show that this body, as met with in commerce, is often a mixture of two distinct alkaloids, probably containing variable proportions of jaborine, and varying in its physiological properties. According to M. Chastaing, pilocarpine may be completely freed from jaborine by treating the nitrate with absolute alcohol. His analyses of the perfectly pure nitrate and of the platinochloride seem to confirm Messrs. Harnack

and Meyer's statement, that the composition of the pure base is represented by the formula $C_{11} H_{16} N_2 O_2$.

A considerable amount of attention has again been devoted to the further study of the cinchona alkaloids. Continuing his researches on the oxidation products of these bases, Mr. Z. H. Skraup shows that quinidine, when suitably treated with potassium permanganate, agrees with quinine, cinchonine, and cinchonidine in yielding formic acid and a base of a phenolic character. By oxidation with chromic acid, both quinine and quinidine yield quininic acid, $C_{11} H_9 N O_3$, a body homologous with cinchoninic acid. The results of a close study of this acid, and of some of its compounds and derivatives, leads this investigator to the conclusion that the acid in question is a carboxylated and methoxylated derivative of chinoline. The action of phosphorus pentachloride on cinchonine hydrochlorate, and subsequent treatment of the product with alcoholic potash, is shown by Mr. W. Koenigs to result in the formation of a new base, *cinchene* ($C_{19} H_{20} N_2$), differing from cinchonine by the elements of a molecule of water, and yielding, when heated with hydrochloric acid, another new base, *apocinchene* ($C_{18} H_{17} N O$), which possesses the characters of an amidophenol. Messrs. A. Claus and H. Weller, expressing a doubt as to the existence of cinchonidine and homocinchonidine as two distinct alkaloids, incline to the assumption that the difference in physical properties of the two substances may arise from the presence of impurities. In opposition to this view, however, Dr. Hesse reasserts the individuality of both, and supports his statement by a reinvestigation of the two alkaloids and their sulphates. He also reports the isolation from the aqueous mother-liquors left in the purification of homocinchonidine sulphate of a new base, answering to the formula $C_{20} H_{26} N_2 O$, which he proposes to name *cinchamidine*. A new alkaloid, described by Messrs. C. Frost and C. Böhringer, under the name of *hydrocinchonidine*, as a product of the action of potassium permanganate upon cinchonidine, is regarded by Dr. Hesse as identical with his *cinchamidine*, as it agrees with the latter in all its properties, and can only be obtained from commercial but never from perfectly pure cinchonidine. Cinchamidine is stated to occur frequently in commercial cinchonidine. In another report the

same author deals with quinamine and some of its salts and derivatives. Both he and Mr. A. C. Oudemans also furnish descriptions of conquinamine, the new alkaloid discovered by the former some time ago in the bark of *Cinchona succirubra*. Replying to some adverse criticism by Mr. A. Christensen respecting the value of Dr. de Vrij's process for the estimation of quinine as herapathite, the author of this method insists upon its accuracy, and cites Professor Jörgensen's opinion in confirmation of his own experience. At the same time he publishes a detailed description of the manipulation of the process, embodying some modifications recently introduced by him in its application.

Chinoline has lately attracted much attention on account of its antipyretic and antiseptic properties. Taken internally, it lowers the temperature in fever without producing any unpleasant after effects, such as giddiness and tinnitus. As an antiseptic, it is stated to be superior to salicylic acid, boracic acid, quinine, and alcohol, and to be alike in its action, no matter whether it is prepared from cinchonine or obtained synthetically by treating a mixture of nitrobenzol, aniline, and glycerol with sulphuric acid. Mr. Ekin, however, calls attention to the fact that specimens of German chinoline he has examined, proved to be carelessly prepared and to represent a mixture of several homologous bodies, pointing out at the same time the risk connected with the application of mere mixtures of aniline and nitrobenzol, such as he has met with under the name of chinoline. Despite the powerful action of pure chinoline as an antiseptic and antifermentative in general, it seems to be incapable of checking or even retarding alcoholic fermentation, and to be remarkably inactive towards yeast cells.

Salicin forms the subject of two reports, one by Mr. R. H. Parker, and the other by Mr. D. B. Dott, both dealing with the solubility of this substance, and its decomposition by heat. Messrs. J. J. Hummel and A. G. Perkin, describe crystallizable compounds of hæmatein and brazilein with sulphuric, hydrochloric, and hydrobromic acids, possessing a much greater tinctorial power and dyeing faster shades than the original uncombined colouring matters. Curcumin has been studied by Messrs C. L. Jackson and A. E. Menke, who find this body to be a diatomic monobasic acid, yielding

a small proportion of vanillin when treated with weak oxidizing agents. Mr. O. Kohlrausch publishes a new process for the extraction of tannin and the preparation of tannin extracts, based on the application of dialysis. The tannin diffuses rapidly through the membrane, leaving the bulk of the colouring matters and other impurities in the dialyser. Oak-bark tannin has been re-examined by Mr. J. Löwe, who reports that, contrary to the general supposition, this body is not a glucoside furnishing glucose and oak-bark red on treatment with dilute acids; but that it is simply transformed by dehydration into the latter substance, with formation of very small proportions of intermediate products. The tannin from the wood of *Quebracho colorado* is found by Mr. P. N. Arata to belong to the group of tannins which, like catechutannic and kinotannic acids, precipitate gelatin and strike green with ferric solutions, but not to agree in its composition with either of these two, nor with any other tannins reacting similarly with persalts of iron. He therefore regards quebrachotannic acid as a distinct chemical species. Quebrachocatechin is believed by him to stand to quebrachotannic acid in the relation of acid to anhydride.

The preparation of succinic acid by the fermentation of tartaric acid has engaged the attention of Mr. F. König, who shows that the conversion may be effected under conditions sufficiently favourable to render the process applicable for the production of this acid for commercial purposes. A report on opianic acid by Mr. O. Prinz, deals chiefly with nitro-, azo-, and chloro-derivatives of this body and some of their combinations. A good deal of interesting information has been lately supplied with reference to benzoic acid. A statement published by Mr. P. W. Bedford to the effect that urine benzoic acid may be readily distinguished from benzoic acid obtained from other sources, by its different behaviour towards potassium permanganate, induced Dr. C. Schacht to investigate more fully the action of this reagent on the various kinds of benzoic acid met with in commerce. He finds that the acid prepared from benzoin reduces the permanganate very much more rapidly than that obtained from any other source, and that this difference is most strikingly manifested in alkaline solution; so much so, indeed, as to render the distinction of the resin acid from all other kinds a very

easy task. Messrs. P. Jacobsen and O. Schlickum, however, point out that this reducing action is not due to the acid itself, but to the impurities present, and the latter chemist particularly traces the action to the cinnamic acid and the empyreumatic oils invariably occurring in commercial benzoic acid, and especially in that sublimed from benzoin. The part played by these empyreumatic oils is at once seen from the fact that the crystallized acid prepared from benzoin by the wet process instead of by sublimation, has no appreciable reducing action on permanganate unless it contains cinnamic acid; while that obtained by sublimation reduces the reagent energetically. Mr. Schlickum also states that the same test may be used for distinguishing the acid from Siam benzoin from that prepared from Sumatra benzoin, by the absence of any odour of oil of bitter almonds during the treatment of the former with the permanganate. For the mere distinction of the sublimed resin acid from all other kinds of benzoic acid, he prefers heating with ammonio-nitrate of silver to the permanganate process, inasmuch as this test is not affected by the presence of cinnamic acid.

The reducing effect of commercial samples of chloroform on potassium permanganate is regarded by M. Yvon as a proof of the presence of objectionable impurities (chlorinated compounds) in the former, and is therefore suggested by him as a means both of testing and of purifying this substance. A critical examination of this test by Mr. D. B. Dott, tends to show, however, that the decolorization of the permanganate by pure chloroform of commerce is due to the presence of alcohol, and not to that of objectionable chlorinated combinations; and that, indeed, the latter, in the absence of alcohol, do not reduce the reagent. As a small proportion of alcohol occurs in even the best samples of British chloroform, Mr. Dott considers this mode of testing as of little practical value.

The alleged existence in oil of lavender of a hydrocarbon boiling at a very high temperature (200–210° C.), and of a stearopten identical with ordinary camphor, is not confirmed by the results of an examination of the English oil recently undertaken by Mr. W. Shenstone and communicated to the meeting of the British Pharmaceutical conference. In harmony with M. Bruylants, Mr. Shenstone arrives at the conclusion that the English and foreign oils of

lavender differ considerably in the proportion of terpene contained in them. In another paper, read at the same meeting, Mr. A. H. Jackson confesses himself unable at present to establish any decided chemical or optical distinction between the oils of cinnamon and cassia, though in odour and taste the two oils are readily distinguishable. He believes that the constituents causing this difference exist in the oils in extremely small proportion. Among other essential oils investigated during the year, may be named those of *Pinus Pumilio*, *Coriandrum sativum*, *Satureja montana*, *Satureja hortensis*, *Santalum album*, Angelica, wild thyme, and mastic.

Mr. O. Widmann gives an account of a partial synthesis of thymol, which he has succeeded in effecting. The starting-point selected by him was cuminol, the principal constituent of the essential oil of cumin, and occurring also in the oil of the fruit of *Cicuta virosa*. Other reports on thymol by Dr. E. Hirschsohn and MM. Hammarsten and Robbert deal with the chemical reactions of this body and the means of distinguishing it from phenol.

As usual there is no lack of matter interesting to pharmacists among the analytical methods published during the year. An investigation of the relative merits of Fehling's and Trommer's tests for sugar leads Messrs. W. Müller and J. Hagen to the conclusion that freshly-prepared Fehling's solution exceeds Trommer's test in delicacy. The latter is found to be much more delicate at 60° C. than at an ordinary temperature, and more so still at the boiling point. The lower the temperature at which Trommer's test is performed, the greater should be the proportion of alkali, in order to attain the utmost sensitiveness in the indications of this test. For the detection of albumen in urine, Mr. A. Raabi recommends the use of trichloracetic acid, applied with the same precautions and in the same manner in which nitric acid is usually employed for this purpose. Messrs. A. Deichmüller and B. Tollens have investigated the cause of the red coloration produced by ferric chloride in some specimens of diabetic urine, and both arrive at the conclusion that the reaction is due not to ethyl acetoacetate, as is generally supposed, but to free acetoacetic acid. The colour reaction between gurjun oil and mineral acids is made the basis of a new method, described

by Dr. A. Jorissen, for the detection of these acids as adulterants in vinegar. The detection of foreign bitter principles in beer forms the subject of a report by Professor Dragendorff, which is sure to be welcome to all engaged in the analysis of food and drink. The same author also publishes his experience respecting the detection of blood-stains. Mr. Becker has critically examined the various methods in use for the estimation of chloric acid, and expresses himself in favour of the reduction of the chlorate in neutral solution by means of pure ferrous sulphate, as giving the best results. Ferrous sulphate, or preferably ferrous chloride, acidified with acetic acid, is recommended by M. Piccini for the destruction of nitrites in cases requiring the detection and estimation of nitrates in the presence of nitrites. M. Guyard describes a method for the estimation of nitric and nitrous acids, which is based on the fact that in presence of marsh-gas and soda-lime at a red heat, the nitrogen oxides, whether free or combined with alkalies, are completely converted into ammonia. Mr. J. West-Knights avails himself of the brucine test for the colorimetric estimation of nitrates in potable waters, and states that the blood-red coloration is permanent if oxalic acid be used instead of sulphuric acid in applying the test. For the purpose of ascertaining the hardness of water by means of the soap test, Professor Tichborne replaces the ordinary soap solution by a neutral solution of oleate of soda prepared by carefully neutralizing a measured quantity of pure oleic acid in spirituous solution with standard soda solution, a few drops of phenol-phtalein being used as indicator, and then making up the whole to a definite volume. The advantages claimed for this solution are, that it can be prepared in a few minutes, that it requires no titration against standard water, and that it is more permanent than the solutions made from ordinary soaps. The detection of lead in potable waters is stated by Mr. S. Harvey to be more readily effected by testing with potassium bichromate instead of sulphuretted hydrogen, especially if a few small crystals of the pure salt be used instead of a solution. The test is certainly handier than sulphuretted hydrogen, and leaves nothing to be desired as regards delicacy; it possesses the advantage, moreover, of not being interfered with by the presence of copper. M. Roux recommends a new volumetric process

for the estimation of lead adapted chiefly to the analysis of alloys. The solution of the lead salt is mixed with a saturated solution of sodium acetate, then precipitated with standard solution of potassium bichromate, and the excess of the latter determined by means of a titrated solution of ammonio-ferrous sulphate, potassium ferricyanide being used as indicator. In reply to adverse criticism on the merits of Fresenius' and Babo's test for the detection of arsenic in poisoning cases, Dr. W. Fresenius asserts that the unfavourable results complained of are due, not to any defects of the test, but to the so-called improvements and simplifications introduced by the critics themselves.

In a communication to the British Pharmaceutical Conference Messrs. Naylor and Braithwaite disprove a statement made some time ago by M. Patrouillard to the effect that arsenic acid may be readily reduced to arsenious acid by the action of oxalic acid. The same paper also deals with a modification of the copper test for arsenic and with the decomposition which takes place between arsenious and mercuric salts. A volumetric process for the estimation of iron by means of sodium thiosulphate, described by Mr. E. Haswell, is a modification of Oudeman's method, consisting in the use of salicylic acid as indicator, and of potassium bichromate as oxidizing agent. Reporting on the volumetric estimation of zinc by means of a titrated solution of potassium ferrocyanide, Mr. R. W. Mahon disputes the correctness of Fahlberg's statement that the presence of manganese does not interfere with this process, and shows the necessity of completely removing this metal before the titration.

M. Prunier suggests an improvement in the purification of zinc sulphate, consisting in the peroxidation of the iron present by means of potassium permanganate instead of chlorine or nitric acid, and the subsequent removal of both iron and manganese by precipitation with a small quantity of weak solution of ammonia. Mr. E. Johnson calls attention to a curious observation with reference to the preservation of ferrous sulphate. The crystals of this salt are found by him to undergo oxidation the more readily the more completely they are excluded from the atmosphere. He attempts to account for this peculiarity by supposing that ferrous sulphate exercises an ozonizing action on the air, and that the ozone thus

formed oxidizes the iron salt the more energetically the less it becomes diluted by mixing with the external air.

Some of the new remedies introduced or discussed during the past year call for a brief notice in this place. An oleoresinous extract from the seeds of *Psoralia corylifolia*, a leguminous plant growing in various parts of India, is described by Dr. K. L. Dey as a valuable remedy for skin diseases, and especially for white leprosy. The same writer directs attention to the astringent properties of the bark of *Wrightia antidysenterica*, which render it a useful remedy in dysentery and other bowel complaints. The plant belongs to the order *Apocynaceæ*, and grows wild in the hilly districts of the Concan, the Ghauts, and some other parts of India. Its seeds are said to possess vermifuge properties. Physiological experiments with *Convallaria majalis*, the well known lily of the valley, carried out by Drs. Bojajawlensky and Troitzky, lead to the conclusion that this plant possesses properties not unlike those of foxglove, rendering it a valuable therapeutic agent in cardiac diseases. The tops of *Calea glabra*, a Brazilian member of the order *Compositæ*, are mentioned by Professor Baillon as a febrifuge, administered in the form of infusion, and the same properties are claimed by Mr. F. B. Meyer for the tops of *Parthenium integrifolium*, likewise a compositous plant, inhabiting the central portion of the United States. Mr. H. Flowers furnishes a detailed description of Chia seeds, a drug derived from the *Salvia hispanica* of northern Mexico, and reputed to possess valuable demulcent properties. The seeds of *Euphorbia Lathyris* have been physiologically examined by MM. Sudour and Caraven-Cachin, and shown to act as a strong drastic purgative and emetic, too powerful and too variable, however, to be safely applied in medicine. Dr. C. Spurway calls attention to the efficacy of the American milkweed, *Asclepias Syriaca*, in some forms of dropsy, especially in those connected with mitral disease. The styptic properties of the leaves of *Plantago lanceolata*, and the mode of applying the drug, forms the subject of a communication to the recent meeting of the British Pharmaceutical Conference by Professor Quinlan. Some Brazilian drugs, described at the same meeting by Dr. Symes, comprise a gum derived from the *Acacia Angico*, said to be useful for chest complaints; a species of elemi

named "*almesca*," and a bark known under the name of "*casca de guassatunga*," an alcoholic tincture of which is used in the treatment of snake bites.

Mr. A. W. Gerrard has continued his investigation on the alkaloidal value of wild and cultivated belladonna plants, and again communicated his results to the British Pharmaceutical Conference. His report tends to show that the wild plants during their first year of growth contain but a very small proportion of alkaloid, and that the formation of the latter is decidedly favoured by a chalky soil. The cultivated plants appear to become richest in active principle during the period of flowering, and to maintain this proportion in the fruiting season. The development of alkaloid is stated to occur simultaneously in the root and the leaves, the former not being exhausted to strengthen the latter. Mr. E. M. Holmes reports upon a false belladonna root, identified by Professor Flückiger as that of *Medicago sativa*, and stated by him to be occasionally met with on the Continent mixed with true belladonna. His description and woodcut illustration of the spurious drug will be the more welcome to the reader since this adulterant is but too likely to be of frequent occurrence among belladonna root imported from Germany. A false senega is described by M. G. Goebel, Dr. J. H. Gunn, and Professor Maisch, and shown by Dr. L. Johnson to be the root of *Polygala Boykinii*, growing abundantly in central Alabama, and possessing expectorant properties. The plant differs from true senega in having a branched stem, obovate leaves in whorls of four or five, and stalked flowers. Its root has no keel like that of true senega, but a larger head or crown, and a loosely adherent bark; it is less acrid in taste, and more difficult to powder. M. Menier calls attention to an adulteration of arnica flowers, consisting of the flower-heads of *Inula britannica*, which may be distinguished from the genuine drug by the paler colour of the ligulate florets and the entire absence of aroma. Besides carthamus, fragments of red poppy petals have recently been observed as an adulterant of saffron, a sophistication which may be readily detected by the infusion turning greyish green with ammonia, and bright red with nitric acid.

Though the liability of opium to the formation of mould is

probably known to every experienced pharmacist, few, perhaps, will be aware that such fungoid growths cause a material reduction in its alkaloidal value. That this is so, however, is clearly seen from determinations published by Dr. C. Bernbeck, showing a falling off from 10·3 to 9·8 in the percentage of morphine in a sample of opium kept exposed to the formation of mould for three months, during which it also completely lost its aroma. The drying of opium immediately after purchase, and its subsequent exclusion from moist air, will therefore commend themselves as wise precautions. In an article on "Indian Opium in Cases of Poisoning," Dr. K. L. Dey lays stress on the detection of porphyroxine as a constituent characteristic of this drug, and absent in Turkey opium. Methods for the assay of opium are published by Dr. E. R. Squibb and MM. Portes and Langlois.

The conflicting statements respecting the chemical constituents of Maracaibo copaiba, have induced M. Brïx to reinvestigate this subject. His results confirm, to a great extent, those obtained by Strauss in 1868.

A whole series of researches have been published respecting a bark known in commerce as *Cinchona cuprea*. According to Dr. C. A. Robbins, the tree yielding this bark grows on the lower mountain ranges adjoining Buccaramanga, at an altitude of 2000 to 3000 feet. Mr. J. Triana states that the bark is furnished by two distinct regions: the one in the great basin of the river Orinoco, to the south of Bogotá; and the other in the lower part of the basin of the Magdalena river. He traces it to two distinct species of *Remijia*, a genus occupying an intermediate position between those of *Cinchona* and *Cascarilla*.

Almost simultaneously, and independently of each other, Messrs. B. H. Paul and A. J. Cownley, Mr. W. G. Whiffen, and Messrs. D. Howard and J. Hodgkin, have recognised the existence in this bark of a peculiar alkaloid, subsequently described by Dr. O. Hesse, under the name of *homoquinine*, and regarded by him as identical with the base observed by Mr. J. A. Tod in 1880. The composition of this alkaloid is found to be represented by the formula $C_{19}H_{22}N_2O_2$. An examination of the bark of the white ash, *Fraxinus Americana*, by Professor F. B. Power, has revealed

to him the presence therein of an alkaloid, the first and only one which has so far been observed in plants of the natural order *Oleaceæ*. *Buxus sempervirens* is found by M. Alesandri to contain three distinct principles, viz., *buxine*, in the bark; *buxeine*, in the leaves; and *parabuxine*, in both leaves and bark, but chiefly in the latter. The reactions of these bodies, and the mode of their preparation, will be found described in the abstract of his paper. The characters of the resin extracted by Mr. C. Manz from the root of *Ipomœa pandurata* seem to indicate that this root approximates more to tampico than to Vera Cruz jalap. The results of a recent reinvestigation of the root of *Gelsemium sempervirens* have convinced Dr. T. G. Wormley that, contrary to the assertion of Messrs. Sonnenschein and Robbins, the principle previously isolated and described by him under the name of gelseminic or gelsemic acid, is not identical with the glucoside æsculin found in the bark of the horse-chestnut. The rhizome of *Aspidium rigidum* is shown by Mr. W. J. Bowman to contain an oleo-resin very similar to that contained in *Aspidium Filix mas*. The presence of a crystallizable bitter alkaloid, of the formula $C_{32} H_{52} N_2 O_3$, has been discovered by Mr. K. Bödeker in *Lycopodium complanatum*. Kala nuts, or Gouru nuts, are found by MM. Heckel and Schlagdenhauffen to be very rich in caffeine, more so, indeed, than coffee; and in addition to this to contain theobromine, some fatty matter, much glucose, and a large proportion of starch, a composition indicating a considerable nutritive value of these seeds. Among other drugs which have formed subjects of chemical research during the year may be mentioned the bulbs of *Zygadenus paniculatus*; the roots of *Althæa rosea* and *Berberis aquifolium*; the rhizome of *Asclepias cornuti*; the barks of *Lonchocarpus Peckolti*, *Sambucus Canadensis*, and *Celastrus scandens*; the leaves of *Sequoia gigantea*, *Tanacetum vulgare*, *Menecylon tinctorium*, and *Heteromeles arbutifolia*; the leaves and bark of *Jacaranda Procera*; the herbs of *Chelidonium majus* and *Viccia Cracca*; the fruits of *Phytolacca dioica*, *Balsamocarpum brevisolium*, and *Leptomeria acida*; the seeds of the pumpkin, cucumber, and *Cucurbita maxima*; and the oleo-resin of *Silphium lacinatum*.

We must not omit to draw the reader's attention to the elaborate

reports on podophyllin and its constituents by Dr. V. Podwyssotzki, dealing exhaustively with all the constituents hitherto isolated from this resin.

Professor P. C. Plugge has investigated the relative activity of aconitines from different commercial sources, and arrived at the conclusion that Petit's nitrate of aconitine has a poisonous action at least eight times stronger than that of Merck's, and one hundred and seventy times stronger than that of Friedländer's, and that the preparations known in British commerce as "German aconitine" are by no means of uniform strength, some of these exhibiting differences greater even than that observed between the aconitines of Merck and Petit. In view of these facts, Professor Plugge emphasises the necessity of physicians exercising the greatest care in prescribing aconitine and its salts, as the dispensing of a different preparation from that intended by the prescriber may lead to the administration of a fatal dose, which in one case has actually occurred. Independent of the different processes by which these various commercial aconitines are prepared, much of the difference in their activity may, no doubt, be attributed to the great variation in the quality and nature of the roots from which they are extracted. That aconite root, as imported, is but too likely to be a variable mixture of different roots, is forcibly pointed out in a communication to the *British Pharmaceutical Journal* by Mr. Holmes, in which he states that the description given in the Pharmacopœia is altogether inadequate for distinguishing the root of *Aconitum Napellus* from that of other less poisonous species, and that the imported roots are collected by peasants not possessed of any botanical knowledge, and sold without any guarantee as to the time of their collection. In his opinion, the only way to secure roots of good and uniform quality is to limit the officinal drug to home-grown aconite, flowering in May and June, and gathered while the plant is in flower.

Mr. A. W. Gerrard publishes a formula for an ammoniated extract of ergot, which he recommends in the place of the ordinary fluid extract on the ground that the ammonia insures a more complete exhaustion of the active principles, and that by its own stimulating effect on the nervous system it may assist the medicinal

action of ergot. The process recommended renders any previous removal of fat from the ergot unnecessary. Referring to a suggestion made by Mr. Hallberg, to remove the fat from nux vomica by means of benzine, as a preliminary step in the preparation of the extract, Mr. T. E. Greenish lays stress on the importance of seeing that the benzine to be used for this purpose is coal-tar benzol, and not petroleum ether (benzoline), as the application of the latter would involve the loss of a considerable portion of the alkaloids contained in the drug. Mr. E. Dannenberg draws attention to the liability of Fowler's solution to spontaneous changes, consisting in the growth of algæ and the conversion of arsenious into arsenic acid by oxidation, and suggests that this preparation should be prepared in small quantities, and preserved in small bottles filled up to the stopper and kept in a horizontal position. For preparing solution of morphine intended for hypodermic use, Professor Hamberg finds the sulphate of this alkaloid to be better adapted than the hydrochlorate, owing to its solution being less prone to decomposition and the formation of mycelia. In order to prevent the deposition of the sulphur in the *confectio sulphuris*, and to obtain a more homogeneous preparation, Mr. P. Bon proposes the introduction of a suitable proportion of tragacanth. Mr. P. W. Lascheid reports very favourably on the value of glucose as an excipient for pill masses, and arrives at the conclusion that this substance may advantageously replace the glycerin of tragacanth. The results of a comparative examination of the various modes of preparing emulsions are published by Mr. C. L. Diehl, along with a number of formulæ for emulsions of special substances.

The present *Year-Book*, like the preceding volume, concludes with a bibliographic section, comprising titles of books, pamphlets, etc., published during the year in connection with chemistry, botany, materia medica, pharmacy, and allied subjects.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Behaviour of Different Kinds of Commercial Benzoic Acid and their Sodium Salts towards Potassium Permanganate in Alkaline Solution. Dr. C. Schacht. (*Archiv der Pharm.*, Nov. 1881, 321.) A statement recently published by P. W. Bedford (see *Pharm. Journ.*, 3rd series, xii., 67) to the effect that urine benzoic acid may be readily distinguished from benzoic acid obtained from other sources by its different behaviour towards potassium permanganate, has induced the author to investigate the action of this reagent on the various kinds of benzoic acid met with in commerce. The samples of acid experimented with were the following:—

1. Urine benzoic acid.
2. Toluol benzoic acid.
3. The so-called "resin benzoic acid, obtained by sublimation" (acidum benzoicum e gummi sublimatum).
4. The acid *really* sublimed from Siam benzoin.
5. The acid prepared from Siam benzoin by the wet process (extraction with lime and subsequent precipitation by hydrochloric acid).

His experiments were also extended to the following:—

6. The same acid as No. 5 subsequently sublimed.
7. Toluol benzoic acid sublimed together with various proportions of Siam benzoin.
8. Benzoic acid which had separated from oil of bitter almonds.

The author adds that the so-called "acidum benzoicum e gummi sublimatum," was formerly a perfumed urine benzoic acid, and at present is a perfumed toluol benzoic acid. As just now the toluol benzoic acid costs only half as much as urine benzoic acid, probably

only the former is used in the preparation of the so-called gum acid.

Experiments made with the different samples named and potassium permanganate in acid solutions (*i.e.*, without the addition of alkali), showed that an immediate decolorization of the reagent occurred with the acids obtained from Siam benzoin, but with none of the others. In all these trials 0·1 gram of the acid was used suspended in 5 c.c. of distilled water, and mixed with 3 drops of a half per cent. permanganate solution.

A much more striking difference was observed in the behaviour of the various acids towards permanganate in an alkaline solution. Upon dissolving 0·1 gram of the acid in 3 c.c. of potash solution of 1·177 sp. gr. at 15° C., diluting with 3 c.c. of distilled water, then adding 5 drops of a half per cent. permanganate solution, and heating the mixture to the boiling point, the first-named three kinds of benzoic acid produced dark-green coloured liquids, in which gradually dark-brown precipitates appeared; while Nos. 4 and 5 (the acids from Siam benzoin) produced immediate decolorization of the liquid and formation of brown precipitates.

Sodium benzoate may be tested in the same manner; but in this case the addition of alkali is unnecessary. The author allows 5 drops of a half per cent. of permanganate solution to act upon a solution of 0·2 gram of the sodium salt in 5 c.c. of distilled water without heat.

In conclusion, the author calls attention to the fact that the different kinds of commercial benzoate of sodium vary in price from 8/6 to 28/- per kilo., according to the kind of benzoic acid they contain.

The Behaviour of Different Kinds of Benzoic Acid towards Potassium Permanganate. P. O. Jacobsen. (*Pharmaceut. Centralhalle*, Dec. 22, 1880, 566.) Referring to the reports on the testing of benzoic acid by P. W. Bedford and Dr. C. Schacht (see the preceding abstract), the author states that absolutely pure benzoic acid—no matter from what source it is obtained—is without action on permanganate, and that the reducing action observed by those chemists is solely due to the presence of impurities. The applicability of the test for the recognition of the sources of the acids to be examined must therefore depend upon the presence of appreciable quantities of impurities having a reducing action on the reagent. Such impurities, however, occur in all commercial samples of the acid.

The Testing of Benzoic Acid. O. Schlickum. (*Pharmaceut.*

Zeitung, xxvii., 24 and 175.) Like Dr. C. Schacht and others (see the two preceding abstracts), the author has investigated the action of the different kinds of benzoic acid on potassium permanganate, with the object of testing the alleged applicability of the reaction as a means of distinguishing the acids prepared from different sources. He arrives at the conclusion that the decolorization of the permanganate is due, not to the benzoic acid itself, but to the cinnamic acid and the empyreumatic oils accompanying it. While toluol and urine benzoic acids produce but a very slight decolorizing effect, the action of benzoin benzoic acid is much more marked, and is proportionate to the amount of cinnamic acid contained in it. The reduction of the permanganate seems to be fully as energetic with the acid from Sumatra benzoin as with that obtained from the Siam resin. In harmony with recent observations by Schneider (*Pharm. Zeitung*, xxvii., No. 20), and contrary to the statements of Dr. C. Schacht, the author observes that the crystallized acid obtained from benzoin by the wet process has no appreciable decolorizing action on permanganate unless it contains cinnamic acid, and that it differs in this respect from the sublimed acid, in which the presence of empyreumatic oil always causes a decided reduction of the reagent. In order to distinguish the acid obtained by sublimation from Siam benzoin from benzoic acid of all other sources, and to show at the same time its freedom from cinnamic acid, the author recommends the following mode of applying the permanganate test:—

0·1 gram of the sample dissolved in 6 grams of boiling water, and mixed after complete cooling with 6 to 10 drops of a half per cent. permanganate solution, should decolorize the reagent either at once or within five minutes, without evolving the odour of oil of bitter almonds.

Finally, the author proposes another test as superior to the permanganate, inasmuch as it is not affected by the presence of cinnamic acid. If 0·1 gram of resin-benzoic acid, no matter whether sublimed from Siam or Sumatra benzoin, is suspended in a few grams of water, then mixed with a few drops of silver nitrate solution and an excess of ammonia, so as to obtain a clear mixture, and now heated to the boiling point, the liquid will assume a brown or blackish colour, owing to the reducing action of the empyreumatic oils. With benzoic acid from all other sources, and even with that obtained by the wet process from Siam or Sumatra benzoin, the mixture remains colourless. This test, therefore, will at once decide whether or not the sample is one of genuine sublimed resin acid;

and if it be desired also to ascertain whether it was obtained from Siam or Sumatra benzoin, it is only necessary to heat the acid with permanganate solution, when the odour of oil of bitter almonds would indicate that Sumatra benzoin was the source of the acid tested.

The Preparation of Benzyl Alcohol. R. Meyer. (*Ber. der deutsch. chem. Ges.*, xiv., 2394–2396.) The preparation of benzyl alcohol by acting upon benzaldehyde with alcoholic solution of potash is a wasteful one, as the decomposition is far from complete. A much better yield is obtained, and the whole process proceeds much more satisfactorily, if an aqueous instead of an alcoholic solution of alkali be employed. The *modus operandi* suggested by the author is as follows:—10 parts of benzaldehyde are agitated in a stoppered cylinder with a solution of 9 parts of potassium hydrate in 6 parts of water until properly emulsified. The mixture is then allowed to stand for 12 hours, during which a copious crystallization occurs, causing the whole almost to solidify. Sufficient water is then added to dissolve the crystals, the solution repeatedly shaken with ether, the decanted ethereal solution evaporated in a retort, and the residual oil distilled without previous drying. After the remainder of the ether and the water have passed over, the thermometer rises rapidly to the boiling point of benzyl alcohol, and the greater part distils within 2 or 3 degrees of that temperature. Towards the very end the temperature rises very high, and a small quantity of a resinous substance is then left in the retort. The yield was found to be 92 per cent. of the theoretical quantity, while with alcoholic potash solution it was only 43 per cent. It is not advisable to dry the benzyl alcohol before distilling it, as it unites with calcium chloride and is attacked by solid potash.

Pure benzyl alcohol boils at 204° C., and is soluble in 25 parts of water.

The process above described is likely to be suitable also for the decomposition of other aldehydes.

Synthesis of Phenols. A. Liebmann. (*Journ. Chem. Soc.*, 1882, 171.) The higher homologues of phenol cannot be obtained by the action of chlorine derivatives of the hydrocarbons on the phenols, but their preparation can be effected by the action of zinc chloride on a mixture of the phenols and alcohols. Thus from phenol and isobutyl alcohol, a butylphenol, $C_4H_9 . C_6H_4 . OH$ (m. p. 98°, b. p. 236–238°) is obtained as a snow-white crystalline mass; it dissolves in alkalies, forming salts sparingly soluble in cold, readily soluble in hot water. This butylphenol is probably iden-

tical with that obtained from butyl aniline by Studer (Abstract, *Journ. Chem. Soc.*, 1881, 898); its ethyl ether boils at 234–236°.

By a similar process, amylphenol (m. p. 92°, b. p. 248–250°) and benzylphenol (b. p. 314–316°) have been prepared, and further researches with resorcinol, orcinol, α- and β-naphthol are promised. These higher homologues of phenol differ, however, from phenol in giving no coloration with ferric chloride.

Purification of Carbolic Acid. W. Alexejeff. (*Bull. de la Soc. Chim.* [2], xxv., 379.) Pure phenol may be obtained from the commercial solid acid by adding to it 5 per cent. of water, melting the mixture, and allowing it to stand. The crystals which are thus gradually formed, are drained and submitted to the same process several times again. Finally they are distilled.

Phenol Hydrate. W. Alexejeff. (*Journ. Russ. Chem. Soc.*, 1882, 110.) The author disputes the existence of the hydrate described by Lowe, and shows the preparation reported upon by that chemist to be a mere mixture of phenol and water. All his attempts to produce a chemical combination of carbolic acid and water proved unsuccessful.

Volumetric Estimation of Phenol. P. Giacosa. (*Zeit. physiol. Chemie*, vi., 43.) The process described is based on the well-known reaction of phenol with bromine water, resulting in the precipitation of tribromophenol. Instead of standardizing the bromine water by means of sodium hyposulphite, he uses for this process solution of pure carbolic acid of known strength. He also describes an apparatus for extracting the carbolic acid from gauze, etc., for the purpose of its estimation.

Comparative Experiments on the Behaviour of Thymol and Carbolic Acid towards different Reagents. E. Hirschsohn. (*Pharm. Journ.*, 3rd series, xii., 21.)

Millon's Reagent.—Thymol (1 in 1000) produces turbidity; on boiling, the solution becomes clear, with violet-red coloration, and turbid again on cooling. 1 in 16,000 gives a pale coloration, the smallest quantity that can be detected.

Phenol gives a red coloration, more or less intense, according to the state of dilution. According to Almén, 1 in 2,000,000 can be detected.

Calcium Hypochlorite and Ammonia.—Thymol: 5 c.c. of a solution of thymol (1 in 1000) are rendered turbid and opaque by 4 drops of ammonia and 1 drop of bleaching powder solution; on boiling, flocks separate, and the solution assumes a greenish colour. In more dilute solutions (1 in 4000) turbidity alone is produced;

1 in 32,000 becomes turbid only on boiling. The green colour imparted to phenol cannot be detected in solutions more dilute than 1 in 4000 (Almén, 1 in 5000).

Sodium Hypochlorite gives with thymol a turbidity which, in solutions of 1 in 1000, remains in presence of excess of the reagent; but solutions containing 1 in 16,000 and less, become clear when excess is added. With phenol, however, a turbidity is formed which is not permanent until a certain quantity of reagent has been added; and even then, if it is treated with a still further quantity of the reagent, a point is reached at which the turbidity again disappears.

Chlorine Water may be used to distinguish between thymol and phenol in the same manner as the previous reagent, similar results being obtained. In the case of thymol, on adding ammonia to the turbid mixture, a solution, more or less greenish, is produced. Chlorine water may be used to detect the presence of thymol in phenol, by avoiding excess of the reagent, a decided turbidity being produced.

Bromine Water gives with thymol a similar reaction to that with phenol, but it is more sensitive, 1 in 60,000 giving a decided turbidity.

Gold Chloride is reduced by thymol, the solution becoming greenish black; 1 in 50,000 produces this result in fifteen minutes. It is only after a lapse of some time that phenol produces a similar reaction.

Platinum Chloride, like gold chloride, is reduced by thymol, but only on boiling, when the solution becomes cloudy, opaque, or transparent, according to the dilution. Solutions of phenol remain clear on boiling.

Nitric Acid.—When boiled with nitric acid, solutions of thymol are coloured from golden to pale-yellow, according to dilution, and generally become opaque or opalescent; a solution containing 1 in 4000 remains clear. Solutions of phenol become clear by boiling, except when diluted to the strength of 1 in 1000, which on cooling become slightly turbid and coloured yellow.

Reactions of Thymol. MM. Hammarsten and Robbert. (*Pharmaceut. Zeitung*, 1881, No. 70.) According to the authors the most delicate reaction of thymol is the following:—The liquid to be tested is mixed with half its volume of glacial acetic acid, then with more than an equal volume of pure concentrated sulphuric acid, and the mixture gently heated. A fine reddish violet coloration will thus be produced, which is still discernible in

solutions containing but 1 part of thymol in 1,000,000. In order to separate thymol from other substances interfering with this test, advantage may be taken of the fact that it is readily taken up from its solutions by ether, especially in the presence of a few drops of hydrochloric acid. Urine, however, requires to be distilled.

The usual reagents for phenol show the following behaviour towards thymol :—

1. Ferric chloride is without action on thymol.

2. Sodium hypochlorite + aniline produces with thymol solutions the same blue coloration as with ordinary phenol.

3. Sodium hypochlorite + ammonia, giving a blue coloration with phenol, produce with thymol a green colour, which gradually changes to blue-green, and in the course of four or five days to red.

4. Millon's reagent gives with thymol a pale red-violet coloration, which disappears on boiling. The red coloration produced with phenol remains on boiling.

5. Bromine water renders thymol solutions turbid, even if the latter be very weak. The precipitate, however, is not crystalline like tribromophenol.

Partial Synthesis of Thymol. O. Widmann. (*Ber. der deutsch. chem. Ges.*, xv., 166. From *Pharm. Journ.*) The author's starting-point was cuminol, $C_6 H_4 . C H O . C_3 H_7$, the principal constituent of the essential oil of cumin, and occurring also in the essential oil of the fruit of *Cicuta virosa*. This was nitrited by treatment with a mixture of fuming nitric and sulphuric acids (nitrocuminol, $C_6 H_3 . C H O . N O_2 . C_3 H_7$), the oxygen in the $C H O$ group was substituted by chlorine by treatment with phosphorus pentachloride (nitrocymylenechloride : $C_6 H_3 . N O_2 . C H Cl_2 . C_3 H_7$), the chlorine in its turn was removed by the action of nascent hydrogen (cymedin, $C_6 H_3 . C H_3 . N H_2 . C_3 H_7$), and the product was treated with potassium nitrite and dilute sulphuric acid, resulting in the substitution of $O H$ for $N H_2$. (thymol, $C_{10} H_{13} O H$), and distilled. To the distillate soda ley was added until all the thymol was dissolved, and this solution was shaken with animal charcoal, filtered, and decomposed with hydrochloric acid. The thymol separated as an oil finely divided throughout the liquid; but upon the addition of a trace of crystalline thymol the drops solidified immediately, forming rhombic prisms, presenting all the properties of natural thymol.

Creasote. A. Kopp. (Translated from *Moniteur Scientifique* in *Pharm. Journ.*, 3rd series, xii., 261–263, and 420–424.) The author

gives an elaborate *resumé* of the chemical history of this body. As it is unsuited for abstraction, we cannot do more here than draw the reader's attention to the publication.

Occurrence of Salicylic Acid in the Violaceæ. K. Mandelin. (*Pharm. Journ.*, 3rd series, xii., 627.) Salicylic acid in the free state occurs in the leaves, stems, and rhizomes of the different varieties of *V. tricolor* and in *V. syrtica*, whilst the petals and seeds contain only traces of the free acid, and a substance which on boiling with hydrochloric acid yields salicylic acid. The leaves of the *V. odorata* do not contain any of the acid, but on boiling the rhizomes with hydrochloric acid, salicylic acid is readily detected, and is present probably as a glucoside. In the other varieties of the *Violaceæ*, salicylic acid is present only in traces, or entirely absent.

The property of salicylic acid to prevent germination probably accounts for the facts that only traces of the free acids are found in the seeds.

The quantity of acid in the different varieties varies from 0·1441 to 0·0829 per cent. calculated on the dried herb free from ash.

Besides salicylic acid, the presence of a body giving an intense yellow colour with alkalies, and a precipitate with basic lead acetate, was detected.

Colorimetric Determination of Salicylic Acid in Alimentary Substances. H. Pellet and J. de Grobert. (*Comptes Rendus*, August 1, 1881. From *Chem. News*, xliv., 168.) The authors prepare a series of eight test-tubes, of from 0·20 to 0·22 metre in height, and of 0·015 to 0·018 metre in diameter, into which are put respectively 1 c.c., 0·75 c.c., 0·50 c.c., 0·30 c.c., 0·20 c.c., 0·1 c.c., 0·05 c.c. of a solution of salicylic acid containing 1 gram. per litre. The volume is in each case made up to 10 c.c. with distilled water. Three drops of ferric chloride, of from 1·005 to 1·010 sp. gr., are then added to the first tube, two to the second and the third, and one drop to the others, except the last, where it is sufficient to touch the inside of the test-tube with the point of the pipette containing the ferric chloride. An excess of the salt of iron considerably modifies the tint produced. They take then, *e.g.*, 100 c.c. of wine, to which are added 100 c.c. of ether and 5 drops of sulphuric acid at 30° B., to displace the salicylic acid from its combinations. Agitate, let settle, draw off the supernatant ether by means of a pipette. This operation is twice repeated, and the decanted ether is rapidly distilled in the water-bath. The residue is transferred into a porcelain capsule of 0·06 meter in diameter.

The retort is washed with a few c.c. of ether, and the whole placed for a few moments on a stove at 35–50° to expel the bulk of the ether. Add at most 1·5 c.c. of a solution of caustic soda, of which 10 c.c. = 0·4 grm. Na H O. This quantity is capable of saturating 0·2 grm. salicylic acid. It is then evaporated to dryness in the water-bath, when the salicylic acid remains as sodium salicylate. The residue of this second evaporation to dryness is mixed with 5 drops sulphuric acid at 30° B., and 20 c.c. benzol are then added. The whole is poured into a test-tube, shaken, and filtered. Take 10 c.c. of the filtrate, and place them in a test-tube of the same size as those containing the colour standards; add 10 c.c. of distilled water, and one or two drops of dilute ferric chloride, and shake several times. If salicylic acid is present, it passes into the lower part of the liquid and occasions a violet colour. The shade obtained is then compared with those of the colour-standards.

Derivatives of Saligenol. K. Bötsch. (*Monatsh. für Chem.*, ii., 621–623. From *Journ. Chem. Soc.*)

Ethylsalicyl alcohol, $C_9 H_{12} O_2 = C_6 H_4 O Et (C H_2 . O H)$, is prepared—like its lower homologue, methylsalicyl alcohol, discovered by Cannizzaro and Körner (*Journ. Chem. Soc.*, 1872, 1095)—by heating potassium-saligenol, dissolved in water, with the theoretical quantity of ethyl iodide in a sealed vessel for three hours at 100°; it is purified by agitation with sulphurous acid, potassium carbonate, and water in succession, and finally by fractionation. This last process must be performed with great caution, as the alcohol has a strong tendency to resinize, especially if the temperature rises a little above the boiling point, or if traces of potassium iodide are present.

Ethylsalicyl alcohol is a colourless liquid having a pleasant ethereal odour, boiling at 265°, solidifying to a crystalline mass at 0°, but liquefying again on slight rise of temperature. It is insoluble in water, but dissolves readily in alcohol and in ether; the alcoholic solution does not give any colour-reaction with ferric chloride. On prolonged exposure to the air, it becomes dark-coloured, and appears to decompose. By oxidation with dilute nitric acid, it is converted into ethylsalicylic acid. With strong hydrochloric acid, in a sealed tube, it yields ethyl chloride and saligenol, which is immediately resolved into water and saliretin.

Methylsalicyl alcohol, $C_8 H_{10} O_2$, is isomeric with Bernheimer's caffeol, obtained by the roasting of coffee. The reaction of this latter compound with alcoholic potash, and with hydriodic acid and phosphorus, and the formation of palmitic acid by fusing it

with potash, show that it is a derivative of saligenol. Cannizzaro and Körner, who discovered methylsalicyl alcohol, say nothing about its odour. Bötsch, however, on preparing it in the manner above mentioned, finds that the crude product has a decided odour of roasted coffee, which, however, disappears completely on purification: whence it follows that caffeol cannot be identical with methylsalicyl alcohol. The two isomeric compounds may most probably be represented by the following formulæ:—

$$\underset{\text{Methylsalicyl alcohol.}}{C_6H_4(OMe).CH_2.OH.} \qquad \underset{\text{Caffeol.}}{C_6H_4(OH)CH_2.OMe.}$$

It is possible, however, that traces of caffeol may be formed in the preparation of methylsalicyl alcohol, and give rise to the odour of the crude product.

Note on Salicin: Its Solubility and Decomposition by Heat. R. H. Parker. (From a paper read before the Pharmaceutical Society, Nov., 2, 1881, and printed in the *Pharm. Journ.*, 3rd series, xii., 378.) The experiments described by the author show that the solubility of salicin in water may be taken as 1 in 28 for cold solution; 1 in 24 if previously dissolved by heat. For dispensing purposes, of course the lower solubility, 1 in 28 must be taken as the standard.

When heated to a temperature exceeding 300° F., salicin is decomposed, yielding a brown resin, water, salicylol, and other bodies. The products appear to be the same, whether the salicin is heated in the dry state or in glycerin.

Salicin: Its Solubility in Water, and its Decomposition by Heat. D. B. Dott. (From a paper read before the North British Branch of the Pharmaceutical Society, Jan. 11., 1882, and published in the *Pharm. Journ.*, 3rd series, xii., 615–616.) The author's experiments show that 1 part of salicin is soluble in 28 parts of water at 60° F., which result agrees with that obtained by Parker. The solubility in boiling water is found to be 1 in 0·7 of parts. In allowing a hot saturated solution to cool, a long time must elapse before the solution becomes reduced to the same strength as one prepared at the same temperature by digestion.

In his paper on solubility (*Chem. News*, xli., 165), the author mentioned some instances of substances being much more soluble in the amorphous state than when in the crystalline state. He endeavoured to try the experiment with salicin, but found that on cooling after fusion, it immediately set into a mass of crystals, unless the heat was continued until bubbles of gas were evolved. It was then amorphous, and much more soluble both in spirit and

in water than ordinary salicin; but it did not dissolve completely in water, indicating that a certain amount of decomposition had taken place, which was confirmed by the fact that it had lost in weight 0·26 per cent. The temperature at which this alteration takes place is about 160° C. (320° F.). The fused mass gains in weight by exposure to the air. Salicin, when heated with water in a sealed tube at 120° C., is decomposed, saligenin, saliretin, salicylol, and glucose being among the products of decomposition. The temperature (260° C.) given in "Watts's Dictionary," as that at which salicin decomposes, is too high.

Conversion of Morphine into Picric Acid. P. Chastaing. (*Comptes Rendus*, xciv., 44.) The phenolic character of morphine recently pointed out by the author, and also by E. Grimaux (*Year-Book of Pharmacy*, 1881, 22), receives further confirmation from a very interesting observation recorded in his present paper. By the action of nitric acid on morphine, an acid product of the formula $C_{10}H_9NO_9$ is obtained, which, when heated with water at 100° under pressure, yields trinitrophenol or picric acid.

The Conversion of Morphine into Codeine. D. B. Dott. (*Pharm. Journ.*, 3rd series, xii., 1009.) The conversion of morphine into codeine effected by E. Grimaux (*Year-Book of Pharmacy*, 1881, 22) has been called in question by Dr. O. Hesse (*Pharm. Journ.*, 3rd series, xii., 157), on account of differences observed by the latter in the rotatory powers of codeine from opium and the artificial base. Experiments conducted by the author with a view of throwing light on this discrepancy have yielded results confirmatory of M. Grimaux's observations.

In a subsequent paper by Dr. Hesse (*Pharm. Journ.*, 3rd series, xii., 1029) shortly after the publication of Mr. Dott's results, the former admits the identity of the two bases.

Oxidation-products of Morphine. P. Chastaing. (*Journ. de Pharm. et de Chim.* [5], iv., 338–343. From *Journ. Chem. Soc.*) When an acoholic solution of morphine is saturated with hydrochloric acid gas, and left at rest for twenty-four hours, morphine hydrochloride is obtained; but if, after saturation, the liquid is allowed to remain at rest several days, again saturated with the acid, and left for a further period of fifteen days, ethylmorphine hydrochloride is formed. In order that this compound may be produced, it is necessary that the quantity of morphine present should be small compared with that of the alcohol and hydrochloric acid. If monhydrated sulphuric acid is added in considerable quantity to the alcoholic solution, the mixture after saturation with hydro-

chloric acid, left to itself for two days, and then slowly evaporated below 85°, the addition of ammonia produces a white precipitate which, when washed with water and dissolved in alcohol, rapidly turns green.

On evaporation of the alcoholic solution by exposure to air, an amorphous substance is obtained which gives all the general reactions of the alkaloids, is neutral to litmus, and has a taste less bitter than that of morphine; dissolves in acids and alkalies, but does not form crystallizable salts. It is oxymorphine hydrate, $C_{17} H_{19} N O_4 + H_2 O$, and dissolves easily in water and alcohol but is insoluble in chloroform and ether. When dissolved in alcohol and exposed to the air, it is gradually oxidized. This substance differs in its properties from the oxymorphine hydrate prepared by Schützenberger's process. It is a derivative of sulphomorphine.

The author, like Anderson, was unable to obtain a nitro-substitution derivative of morphine by the action of nitric acid. By slowly evaporating morphine twice with nitric acid of sp. gr. 1·42, and then heating the product on the water-bath until all nitrogen oxides were driven off, he obtained an acid of the composition $C_{11} H_{11} N O_9$; by evaporating with nitric acid three times, the acid, $C_{10} H_9 N O_9$, was obtained. This compound is not acted on by nitric acid of sp. gr. 1·42 at 100°. When it is heated with potash, methylamine is evolved, and if the solution of the alkalies is concentrated, almost the whole of the nitrogen is given off in this form. The potassium salt does not crystallize well, but appears to contain four atoms of the metal. The barium salt has the composition $C_{10} H_5 Ba_2 N O_9 + 4 H_2 O$, and is obtained as a white precipitate by adding baryta water to an aqueous solution of the acid. The lead salt has a similar composition.

Solubility of Morphine in Water. P. Chastaing. (*Répert. de Pharm.*, 1881, 219.) The author determined that 1 litre of water at 3° C. dissolves 0·03 gram, at 22° C. 0·22 gram, and at 42° C. 0·42 gram of morphine. Above 45° C. the solubility increases rapidly, and at the boiling point, 1 litre of water dissolves 2·17 grams of the base.

The Solubility of the Officinal Morphine Salts in Water and Alcohol. J. U. Lloyd. (*New Remedies*, May, 1882.) The author's results are summarized in the following tables:—

Acetate of Morphine.

109·55	parts water, 60° F.,	dissolved	9·35	parts	= 1	to 11·70
61·6	,, ,, boiling,	,,	45·8	,,	= 1	,, 1·34
136·7	,, alcohol, 60° F.,	,,	2·0	,,	= 1	,, 68·30
151·2	,, ,, boiling,	,,	11·4	,,	= 1	,, 13·30

Hydrochlorate of Morphine.

288·9	parts water, 60° F.,	dissolved	12·4	parts	= 1	to 23·40
61·6	,, ,, boiling,	,,	119·9	,,	= 1	,, 0·51
119·2	,, alcohol, 60° F.,	,,	1·9	,,	= 1	,, 62·70
151·2	,, ,, boiling,	,,	4·9	,,	= 1	,, 30·80

Sulphate of Morphine.

315·4	parts water, 60° F.,	dissolved	15·6	parts	= 1	to 21·60
61·6	,, ,, boiling,	,,	81·3	,,	= 1	,, 0·75
280·6	,, alcohol, 60° F.,	,,	0·4	,,	= 1	,, 701·50
705·6	,, ,, boiling,	,,	4·9	,,	= 1	,, 144·00

All parts are understood to be by weight. The alcohol used was of ·820 sp. gr.

Some New Colour Reactions of Morphine, Codeine, and Atropine. Dr. D. Vitali. (*Boll. Farmaceut.* (Milano), 1881, 197. From *New Remedies.*) The new reaction for morphine is based upon a reaction previously observed by Tattersall. The latter found that, by treating a small quantity of morphine, in the cold, with very little arsenate of sodium and some concentrated sulphuric acid, there is produced a violet coloration, which passes into light green on heating. According to the author, the above reaction makes its appearance only slowly in the cold; but on agitating the liquid with a glass rod, a bluish tint verging to violet is produced. By continuously heating, the colour passes over into dark green, dirty greenish blue, and finally light green. But the change of colour does not stop here; on cautiously adding some water, the colour changes first to dark red, then becomes decidedly blue; if, however, alcohol be added, the first drops produce a wine-red, and a larger quantity a most magnificent violet. If to the above-mentioned green mixture some acetic acid be added, the colour becomes wine-red; the further addition to this solution of a few drops of ammonia, so as to leave the liquid still acid, developes a magnificent blue; and on supersaturating with ammonia, this colour passes into an intense green. In the same manner, the solution which has become blue by the addition of water (as before stated), and that which has been rendered violet by alcohol, become green with

ammonia. The colouring matter remains suspended in the liquid, in a flocculent condition.

Morphine heated with sulphuric acid, in absence of arsenate of sodium, becomes first dark red, and on increasing the heat, dark green. If this solution be treated with water, alcohol, acetic acid, and ammonia, like the above solution containing arsenate of sodium, the same colour reactions are obtained, but the tints are not so vivid.

Another brilliant reaction of morphine is the following:—If to a crystal of the alkaloid, in a porcelain capsule, a few drops of concentrated sulphuric acid be added, solution promoted by agitation, then a small drop of solution of sulphide of sodium be dropped in, and the whole cautiously heated, the liquid assumes a flesh-coloured tint, changing to intense violet, dark green, and dirty green.

Again, if to a little morphine, two drops of sulphuric acid be added, then, after agitation, one drop of solution of sulphide of sodium, and finally one drop of a 2 per cent. solution of chlorate of potassium in concentrated sulphuric acid, stirring with a glass rod developes a tint at first greenish, turning to blue with a tendency to violet. With an additional drop the green becomes intense, and passes with continued stirring into dark blue; with more of the chlorate solution a yellowish tint is produced.

Codeine presents the same reactions, excepting in the following particular: while the solution of morphine in sulphuric acid with arsenate of sodium, when heated, turns dirty green, that of codeine, under similar circumstances, assumes a very handsome reddish violet tint; on further heating, it becomes green, and yields the same colour reactions as morphine, with water, alcohol, acetic acid, and ammonia.

Atropine gives also a similar interesting reaction. If a solid fragment of the alkaloid or one of its salts is moistened with a few drops of the solution of chlorate of potassium in sulphuric acid, the former becomes greenish blue, and, on moving the liquid gently about in all directions, bluish green streaks are seen to pass from the fragments through the liquid, which latter gradually assumes a pale green colour.

Colour Reactions of Morphine and Codeine. D. B. Dott. (From a paper read before the North British Branch of the Pharmaceutical Society, Jan. 11, 1882, and printed in the *Pharm. Journ.*, 3rd series, xii., 615.) The author has repeated the experiments of Dr. Vitali (see the preceding abstract), and with results differing in many cases from his.

When morphine is dissolved in strong sulphuric acid, only a very faint pink colour is produced, what some persons are pleased to call a "rose-pink." The German Pharmacopœia asserts that morphine and its salts dissolve in sulphuric acid without colour. This statement does not agree with the author's experience. When the purest morphine obtainable was dissolved in specially purified sulphuric acid, a solution was produced of a distinct though faint pink colour. It would therefore appear that the German Pharmaopœia is on this point not quite correct. On gently warming the solution of morphine in sulphuric acid, an indefinite coloration is produced, and on continuing the heat until the acid begins to volatilize, the solution becomes almost black; now allowing to cool and diluting with water, a greenish blue colour is produced, which on addition of ammonia in excess becomes green.

In oil of vitriol with arsenate of sodium, morphine dissolves without colour. On gently warming a slight blue colour is produced. On raising the temperature, the colour passes into green, then into blue, and finally, when the acid volatilizes, again into green.

When morphine is dissolved in strong sulphuric acid, and a few drops of solution of sodium sulphide added, no colour is developed. On carefully warming, a rose-pink coloration is produced, which disappears on further heating. As the acid volatilizes, the usual black colour appears. This test is much affected by the proportion of sodium sulphide employed.

Although not absolutely the same, the reactions of codeine with these reagents are practically undistinguishable from those of morphine.

A blue colour with ferric chloride, an orange-red with nitric acid, and the blue-green colour when warmed with strong sulphuric acid and arsenate of sodium, afford, in the author's opinion, conclusive evidence of the presence of morphine.

Codeine may be distinguished by its giving negative results with the two first of these reagents, while it yields a violet-blue with oil of vitriol and sodium arsenate.

Pseudomorphine gives the blue colour with ferric chloride and the red colour with nitric acid, but it fails with the arsenate reaction, and gives a decided green colour when heated with strong sulphuric acid.

Contribution to the Knowledge of the Alkaloids of Papaveraceæ. J. F. Eykman. (Abstract of the author's pamphlet, "Beitrag zur Kenntniss der Papaveraceen-Alkaloide." *New Remedies*, June

1882.) Concerning the alkaloids of the *Papaveraceæ*, we have at present more or less extended researches on *Papaver somniferum* and *Rhœas*, *Chelidonium majus*, *Glaucium luteum*, *Sanguinaria canadensis*, and *Eschscholtzia californica*. Of these the opium bases have received the largest share of attention. The labours of Hesse and others have thrown much light on the different series of homologues existing in opium, among which are at least fifteen well-defined alkaloids. The researches of Wright, Beckett, etc., have considerably increased the number of these homologous series by the preparation of many acidoxyl-derivatives, and have furnished clues to a knowledge of the constitution of these bases.

Much less attention has been paid to the other papaveraceous plants, and the number of alkaloids which they contain is much smaller. Besides the poisonous sanguinarine (= chelerythrine), which is characterized by the orange-red colour of its salts, a second alkaloid, yielding colourless, salts has been met with in all these plants. Chelidonine was discovered by Godefroy in the root of *Chelidonium*, glaucopicrine in the root, and glaucine in the leaves, of *Glaucium luteum* by Probst; Riedel discovered in the root of *Sanguinaria* the alkaloid named by Gibb "porphyroxine;" and Walz found in the *Eschscholtzia* a bitter and an acrid alkaloid. Wayne claims to have found a third alkaloid in sanguinaria root, which Gibb called puccine.

Of all these bases, only sanguinarine and chelidonine have been somewhat carefully studied; while the data respecting the others are insufficient to properly characterize them.

Since the number of alkaloids known to exist in opium has risen to at least fifteen, it may be suspected that it merely requires a further research to find, in the other papaveraceous plants, a still greater number of alkaloids belonging to homologous series. The great difficulty of separating the latter and obtaining them pure, and the fact that many supposed opium alkaloids formerly accepted have in late years turned out to be mixtures of several others, lend great probability to this suspicion.

A more detailed study of these plants appears very desirable, and likely to yield interesting results. It is a remarkable fact that, while one and the same alkaloid (sanguinarine) has been shown to exist in all the other papaveraceous plants, it does not appear to occur in *Papaver*, and none of the substances found in opium seems to be identical with any of those extracted from other members of the family.

Hence, while sanguinarine constitutes a chemical link between

most of the Papaveraceæ, no such link seems to exist between these and *Papaver*. The name porphyroxine, which has been applied to two different substances, one prepared from sanguinaria and the other from opium, does not imply that these two bodies are identical; besides, one of these has since been shown to be a mixture.

The analogies which may be traced between sanguinarine and some of the alkaloids of opium, though not at present to be depended on, at least justify the supposition that a more exact study of the papaveraceæ will show the alkaloids existing in them to be either identical or isomeric with those of opium, or to form new members of the homologous (or isologous) series.

The discovery of such alkaloids, identical or homologous with those of opium, would not only form an additional proof of the chemical relationship of papaver with the other papaveraceæ, but would also perhaps permit the employment of some of the latter for the preparation of alkaloids at present only obtainable from opium.

The author gives the following account of an investigation of *Macleya cordata*, a papaveraceous plant not previously studied.

Macleya cordata, R. Br. (*Bocconia cordata*, Wild.) is a native of Japan, and belongs to the same sub-tribe as sanguinaria, namely, Bocconieæ. It is known in Japan as a poisonous plant, and grows almost everywhere, upon hills and mountains, in uncultivated spots.

The hollow stem of the (perennial) herb grows to a height of more than one metre, the leaves are up to 30 cm. (11¾ inches) long. On puncturing the stem, veins of leaves, or fruit, an orange-yellow milky juice exudes. The small flowers are arranged in a large panicle, and consist of two white sepals, many hypogynous stamens, and an ovary which grows to a lancet-shaped fruit of 2 cm. in length and 1½ cm. in thickness. The seeds are small and have a red colour. The root is about 5 cm. thick, and on cross-section is seen to have a red colour near the periphery. It flowers in July.

The Japanese names of the plant are numerous, varying in the different provinces. The most common are: takenikusa, tsiampan-giku, and tachiobaku.

An assay of the root and leaves with Mayer's solution showed that they contained about the same quantity of alkaloid (0·5–1·0 per cent.) as *Chelidonium majus*. Calculated for dry substance, the fruit appeared to contain the largest quantity of sanguinarine, the root much less, and the leaves the least quantity. The other

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The discovery of such alkaloids, identical or homologous with those of opium, would not only form an additional proof of the chemical relationship of papaver with the other papaveraceæ, but would also perhaps permit the employment of some of the latter for the preparation of alkaloids at present only obtainable from opium.

The author gives the following account of an investigation of *Macleya cordata*, a papaveraceous plant not previously studied.

Macleya cordata, R. Br. (*Bocconia cordata*, Wild.) is a native of Japan, and belongs to the same sub-tribe as sanguinaria, namely, Bocconieæ. It is known in Japan as a poisonous plant, and grows almost everywhere, upon hills and mountains, in uncultivated spots.

The hollow stem of the (perennial) herb grows to a height of more than one metre, the leaves are up to 30 cm. ($11\frac{3}{4}$ inches) long. On puncturing the stem, veins of leaves, or fruit, an orange-yellow milky juice exudes. The small flowers are arranged in a large panicle, and consist of two white sepals, many hypogynous stamens, and an ovary which grows to a lancet-shaped fruit of 2 cm. in length and $1\frac{1}{2}$ cm. in thickness. The seeds are small and have a red colour. The root is about 5 cm. thick, and on cross-section is seen to have a red colour near the periphery. It flowers in July.

The Japanese names of the plant are numerous, varying in the different provinces. The most common are: takenikusa, tsiampan-giku, and tachiobaku.

An assay of the root and leaves with Mayer's solution showed that they contained about the same quantity of alkaloid (0·5–1·0 per cent.) as *Chelidonium majus*. Calculated for dry substance, the fruit appeared to contain the largest quantity of sanguinarine, the root much less, and the leaves the least quantity. The other

alkaloid (forming a double iodide soluble in alcohol) exists in root and leaves about in equal proportion, and is less in the fruit.

The root, of which larger quantities could be obtained, was further examined. Sanguinarine was extracted in the usual manner. The root having been exhausted with dilute sulphuric acid and alcohol, the percolate was deprived of alcohol by distillation, then supersaturated with ammonia, the precipitate (which had a dirty violet-red colour, the same as the liquid portion) filtered off after a few days, and, after drying, extracted with ether until the latter no longer acquired a yellow colour.

Gaseous hydrochloric acid was conducted through the clear ethereal solution, whereby a scarlet precipitate was produced, which was washed with ether and was freed, by treatment with a little water, from an almost white substance which remained undissolved. The orange-red solution was again mixed with ammonia, the gray-violet precipitate extracted with ether, and gaseous H Cl again conducted through the liquid. These operations were repeated several times more, and finally the ethereal solutions were decolorized by animal charcoal. In this manner a dark scarlet powder was obtained, easily soluble in water, and generally exhibiting the reactions of hydrochlorate of sanguinarine.

Mixed with a little water, it melted, on the water-bath, to a dark-red syrupy liquid, which, after cooling, congealed to a crystalline mass. The dark orange-red aqueous solution yielded more or less yellow to orange coloured precipitates with most metallic salts. Ferric chloride, cupric sulphate, and lead acetate, however, produced no precipitate. Tannic acid, with agitation, produced a precipitate which gradually increased, particularly on addition of hydrochloric acid.

The ethereal solutions, from which the hydrochlorate of sanguinarine had been separated by hydrochloric acid gas, were freed from ether by distillation, and the residue was treated with water. This left behind a brown resin (sanguinarin-resinoid ?). From the filtrate the alkaloid was precipitated with ammonia, and, after drying, extracted with ether. The portion insoluble in ether was rubbed with hydrochloric acid, and the portion still remaining insoluble, together with the residue left in previous purifications of the hydrochlorate of sanguinarine, further purified by recrystallization from water. It could not, however, be obtained in a pure state by this method, since the solutions always assumed an intense orange colour on evaporation. The aqueous solution of this substance, which turned out to be the hydrochlorate of an alkaloid, was therefore

treated with ammonia, the precipitate (in order to remove any still adhering sanguinarine) first extracted with ether, and the insoluble portion afterwards boiled for some time with absolute alcohol. This removed a large proportion of the colouring matter, and left most of the alkaloid behind. The latter was then again converted into the hydrochlorate by trituration with hydrochloric acid, and recrystallized from alcohol. The purest portion of the separated crystals was dissolved in boiling water, the alkaloid precipitated by ammonia, dissolved in boiling alcohol, and precipitated by addition of ether. This treatment was continued until colourless, though small, crystals were obtained. They melted at 201° C. (uncorrected), and had the properties below mentioned.

The original greyish black powder produced by precipitating the extracts from the root with ammonia, and which had been exhausted with ether until the latter no longer acquired a yellow tint, was percolated with alcohol. The dark-brown percolate was freed from alcohol by distillation, the residue treated with acetic acid to faintly acid reaction, and then mixed with water until nothing further was separated. The filtrate was mixed with excess of solution of iodide of potassium, the voluminous precipitate (which soon shrivelled up) filtered off and washed with water. This washing produced a white precipitate in the filtrate, which was separated by a new filtration. Each of these substances, viz.: the last precipitate (*A*), the brown-coloured filtrate (*B*), and the hydriodate remaining on the original filter were separately examined. The latter was first recrystallized from water, whereby a still purer hydriodate (*D*) and a fresh mother-liquor (*C*) were obtained.

A. The white precipitate produced in the filtrate by the washings was dissolved in boiling water, the solution treated with ammonia, and then shaken with ether. The separated ethereal solution, on evaporation, left an almost white residue, from which ether readily separated a soluble body. The portion remaining insoluble in ether became partially soft and assumed a red colour at 180° C., and was melted completely at 198° C.

B. The filtrate after removal of *A* was treated with ammonia, the precipitate separated from the liquid, dissolved to neutralization in acetic acid, and separated from a substance thereby remaining insoluble. The alkaloid was further purified by recrystallizing its oxalate from water, and, after having again separated the alkaloid, recrystallizing it from chloroform. In this way large crystals were obtained, melting at 200·5° C. (uncorrected).

C. The mother-liquor of the recrystallized hydriodate. The base

having been separated from it by excess of soda, it was filtered off, dissolved in boiling alcohol, and crystallized by spontaneous evaporation. After purification and recrystallization from chloroform, the alkaloid had the melting point 201° C. (uncorrected).

D. The once recrystallized hydrochlorate was covered with solution of soda, set aside for one day, then the crystalline alkaloid filtered off and washed. After complete purification, this was chiefly used in the further investigation of the properties, etc., of the alkaloid.

The alkaloid separated from the hydriodate was boiled with strong alcohol to separate it from the accompanying brown substance; but the attempt was only partially successful. The alcohol was then poured off and chloroform added to the still moist crystalline mass.

As soon as the alkaloid had dissolved in the chloroform, two layers were formed, the upper (alcoholic) being quite dark and black, the lower (chloroformic) having only a light brown tint and containing the alkaloid in solution. The lower layer was separated, and after the chloroform had been distilled off, the residuary alkaloid converted into the acid oxalate which is readily soluble in hot water. From the solution the base was precipitated by soda, and then boiled with absolute alcohol. The white portion remaining insoluble therein was dissolved in a little chloroform, precipitated by addition of ether, and finally again recrystallized from chloroform.

In this way about 5 grams of quite large, colourless, well-developed and transparent crystals were obtained. At every fractional crystallization the melting point was 200·5° to 201° C., which appears to be a satisfactory proof that the alkaloid (*macleyine*) is a pure and simple body.

Properties of the Alkaloid.—*Macleyine* is almost insoluble in water and alkalies. On adding ammonia to an aqueous solution of the salt, and filtering, the filtrate after a while deposits wart-like crystals. These are scarcely soluble in cold, a little more soluble in boiling alcohol; also very little soluble in ether, except when freshly precipitated; very little in cold benzol, more so in boiling. Chloroform, especially when warm, dissolves them tolerably well. Macleyine has no pronounced taste, but its salts have a bitter, afterwards sharp and cooling taste.

When crystallized from chloroform or ether, or precipitated by alkalies and dried by exposure to air between blotting paper, the alkaloid is obtained anhydrous. Analysis led to the formula

$C_{20}H_{19}NO_5$. Macleyine exhibits a number of interesting reactions, which will be found fully described in the original paper. It was owing to these reactions, and to the general properties of the alkaloid, that the author was led to suspect its identity with one of the opium alkaloids, namely, *protopine*, the rarest of the series. The agreement of the observed properties of macleyine with those described by Hesse for protopine, was found to extend to the globular or warty form of the substances when separating from ether, their solubility in different menstrua, their ultimate composition, the composition of their platinum salts, and other properties of the salts. In other respects also the agreement is nearly as close as in the former, and the slight differences observed may be owing to accidental circumstances. The author does not claim that the identity is proved, but thinks it has been rendered highly probable.

Crystallized Hyoscyamine. H. Duquesnel. (*Journ. de Pharm. et de Chim.* [5], v., 131. From *Pharm. Journ.*) In undertaking the investigation of the active crystallizable principle contained in henbane seeds, the author tried a number of methods, among which were the previous removal of the oil from the seeds, and the separation of the oily principles from the alcoholic extract; but without obtaining other than an amorphous product, or at most a confused crystallization in the midst of a considerable mass of syrupy consistence. It then occurred to him to examine the abundant fatty matter which occurs in henbane seeds, and which, by previous investigators, has usually been carefully removed by various solvents in a preliminary operation. For it has been shown by several chemists—and chiefly by Lefort, in an important memoir published in 1870 upon the sulphocarbonic extracts, and their employment in the preparation of medicinal oils—that the alkaloidal salts of the *Solanaceæ* are found, at least in part, in the extracts obtained from the plants by treatment with carbon bisulphide.

If henbane seeds, freshly and finely powdered, be exhausted by displacement with boiling 90° alcohol acidulated with tartaric or other vegetable acid equal to one-half part per 1000 of the weight of the seeds, and the tincture distilled to remove all the alcohol, an extract is obtained that separates into two very distinct layers.

The lower layer is partially soluble in water, which separates from it a nearly solid resinous matter. From this layer the author has separated a slightly coloured inodorous product, very different from the commercial product, but still amorphous.

The upper layer, which equals in weight about one-third of that

of the seeds employed, is a green oil, which, as previously stated, has usually been removed by chemists as a preliminary operation and rejected. But the author found it to contain a considerable quantity of alkaloid (about 1 part in 2000 parts of the seeds employed), which readily assumed the crystalline form.

The process followed for its extraction was as follows :—The green oil is separated by decantation from the syrupy layer beneath it, and shaken several times with sulphuric acid, which removes the alkaloid that was combined, no doubt, with a fatty acid. The acid liquid which collects at the bottom is drawn off by means of a tap, and the operation is twice repeated with fresh quantities of dilute acid. The united acid liquors are then almost saturated with potassium bicarbonate, filtered, and evaporated in a water-bath to a syrupy consistence. When cooled the product is treated with strong alcohol, which leaves the potassium sulphate undissolved, and the alcoholic solution is distilled to remove all the alcohol. The residue is suspended in distilled water, so as to form a clear syrup; potassium bicarbonate is added in slight excess, and the mixture is shaken several times with chloroform, which takes up the alkaloid set free. The chloroform, decanted and filtered, is treated with dilute sulphuric acid in very slight excess, and the sulphate of hyoscyamine so formed, which floats to the top of the liquid, is decolorized with washed animal charcoal, and then evaporated to a syrupy consistence at a gentle heat.

In extracting the alkaloid, it is necessary to avoid as much as possible the action of alkalies, which easily alter hyoscyamine before it is freed from impurities. The sulphate obtained is therefore mixed with dry precipitated carbonate of lime in excess, which by prolonged contact sets free the instable carbonate of the alkaloid, and afterwards the hyoscyamine. The mixture, with the addition of a little sand to divide it better, is dried thoroughly at a gentle heat; or preferably under a glass over sulphuric acid. It is then finely powdered, and exhausted with chloroform until the solvent no longer gives an alkaline reaction. The chloroform is partly distilled off at a gentle heat, and the remainder evaporated spontaneously with addition of a little rectified toluene, which retards the evaporation and favours the formation of crystals of hyoscyamine.

The alkaloid is thus obtained in long prismatic, colourless, inodorous needles, grouped in stars round a central point. It dissolves notably in water, to which it communicates a strong alkaline reaction, freely in alcohol and ether, and especially in chloroform. A small portion dissolved in either of the latter liquids, with diffi-

culty reassumes the crystalline form on evaporation of the solvent. It combines with acids, and forms with sulphuric acid a neutral crystalline, slightly deliquescent salt. A small quantity brought into contact with a few drops of monohydrated sulphuric acid, a few grains of potassium bichromate and water, gives off, like atropine, an agreeable odour of bitter almonds. It also gives the same violet colour as atropine when heated with nitric acid and treated with alcoholic solution of caustic potash.

The alkaloid is a powerful mydriatic, under similar conditions as energetic as atropine, if not more rapid and persistent in its action.

Daturine. L. Pesci. (*Gazz. Chim. Ital.*, 1882, 59–61. From *Journ. Chem. Soc.*) This alkaloid, extracted from the seeds of the thorn-apple (*Datura stramonium*), is generally regarded as identical with hyoscyamine from henbane (*Hyoscyamus niger*); but according to the author of this paper, the alkaloids obtained from these two sources are distinct. He prepares daturine by digesting bruised thorn-apple seeds for twenty-four hours at ordinary temperatures with twice their weight of ordinary alcohol holding in solution 3 grams of tartaric acid in a litre; repeating the digestion with an equal quantity of the same liquid, then distilling off the alcohol; treating the brown viscid residue with water, filtering, concentrating to an extract; adding, after cooling, an excess of caustic soda sufficient to form a thick syrup, and agitating this syrup with commercial benzolin previously washed with dilute sulphuric acid. The benzolin used for this operation, after being freed from the dissolved alkaloid by dilute sulphuric acid, was again placed in contact with the extract of the seeds, and these operations were repeated four times. The whole of the dilute sulphuric acid which had been used to extract the alkaloid, was then rendered alkaline with ammonia and shaken up with chloroform, and this liquid, after concentration to about 10 c.c., was diluted with an equal volume of benzolin, and the mixture was left to evaporate; whereupon, after twenty-four hours, it deposited the alkaloid in concentric groups of thin white needles which were purified by pressure between bibulous paper, redissolution in chloroform, and dilution with benzolin.

The base thus prepared melted at 106–108°, agreeing therein with Ladenburg's determination, whereas a specimen obtained from Schuchardt's factory liquefied at 97–99°, and another from the Pharmacie Centrale de la France at 109–110°. The *hydrochloride* and *sulphate* crystallize in thin colourless needles, having a nacreous lustre. The *aurochloride*, $C_{17}H_{23}NO_3, HCl, AuCl_3$, crystallizes in

groups of light yellow needles, melting at 137–139°, whereas Ladenburg found the melting point to be 159°.

Daturine behaves like atropine with all reagents, excepting platinic chloride. A 1 per cent. solution of atropine in acetic acid gives with this reagent a yellow crystalline precipitate, whereas it is not precipitated by a solution of daturine of equal strength.

Daturine is converted by nitric acid into a base exhibiting all the characters of *apoatropine*, yielding an amorphous aurochloride, $C_{17} H_{21} N O_2, H Cl, Au Cl_3$, very slightly soluble in water, and melting at 106–108°. The same base, heated at 90–100° with baryta-water, is resolved into atropic acid and tropine.

Hyoscine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, 1881, 1870.) This alkaloid, recently discovered by the author (*Year-Book of Pharmacy*, 1881, 19), has been made by him the subject of a further study, with the object of preparing some readily crystallizable salts suitable for medicinal use. He now describes the hydriodate and hydrobromate, both of which will answer well for this purpose.

Hydriodate of hyoscine crystallizes from water, in which it only moderately soluble, in small, stout, monosymmetric, hemimorphous prisms, which mostly have a slight yellow colour. Dried at 100° C., the salt had the composition $C_{17} H_{23} N O_3 . H I . \frac{1}{2} H_2 O$.

Hydrobromate of hyoscine is very easily soluble in water. It forms large colourless, transparent, and sharply defined crystals, sometimes of 1 to 2 cm. in length. They are rhombic, hemihedric prisms, which, when exposed in the desiccator over sulphuric acid, lose three molecules (12·27 per cent.) of water. Afterwards dried at 100° C. in vacuo, they yield nothing more. The composition is $C_{17} H_{23} N O_3 . H Br \frac{1}{2} H_2 O$, when dry; when crystallized, the water amounts to $3\frac{1}{2} H_2 O$.

Alcamines. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiv., 1876; *Pharm. Journ.*, 3rd series, xii., 280.) Whilst pursuing his investigations upon tropine, the author came to the conclusion that this base contained an alcoholic hydroxyl group to which was due the exceptional property of forming fresh alkaloids when treated with certain acids in hydrochloric solution, as in the preparation from it of atropine, homatropine, etc. He has now succeeded in the formation of a series of analogous bases by the reaction of chlorhydrines upon secondary amines; these bases, like tropine, yielding other compounds that are always basic and resemble natural alkaloids in their properties and composition. For these bases, which perform the double function of an alcohol and an amine, the author proposes the name "*alcamines*," and for the basic ethers

derived from them that of "*alcameines.*" Thus, by the action of ethylenic chlorhydrine upon piperidine, "*piperethylalcamine* ($C_7 H_{15} N O$) is formed, which, when treated in hydrochloric solution with an acid yields the corresponding "*alcameine,*" That resulting from the action of phenylacetic acid, for instance, has a composition represented by the formula $C_{15} H_{21} N O_2$, and forms crystallizable salts. It is a powerful poison, acting on the respiration and heart. The number of new "alkaloids" thus brought within the range of possibility appears to be unlimited, and to promise a wide field for physiological research.

Strychnine. E. Jahns. (*Chem. Centr.*, 1881, 367.) The different forms of crystals obtained by fractional precipitation of strychnine from solutions of its salts by ammonia, led Schützenberger to suppose that ordinary strychnine might be a mixture of several distinct alkaloids. So far as the difference of the shape of the crystals is concerned, the author is unable to endorse this view, as he finds that the needles at first obtained pass spontaneously into octahedrons, the transformation being easily seen under the microscope.

The Isolation of Strychnine in Analysis. A. H. Allen. (*Analyst*, 1881, 141.) In the place of ether or chloroform for the extraction of recently precipitated strychnine from aqueous solutions, the author suggests the use of a mixture of equal volumes of the two menstrua named. Such a mixture separates much more readily from aqueous liquids than chloroform, and is a much better solvent of strychnine than ether.

Strychnine Sulphate. C. Rammelsberg. (*Ber. der deutsch. chem. Ges.*, xiv., 1231.) The commercial salt, $C_{21} H_{22} N_2 O_2, H_2 S O_4 + 2 H_2 O$, crystallizes in needles which part with their water at 150° C. The neutral sulphate, $(C_{21} H_{22} N_2 O_2)_2 H_2 S O_4$, may be obtained by dividing a solution of the acid sulphate into two equal portions, precipitating one of these by ammonia, then adding the precipitate to the other portion, and boiling the mixture. On cooling, the liquid deposits the neutral salt in transparent prisms, containing 5 molecules of water, with which they part at 200°. If an aqueous solution of this salt be allowed to evaporate spontaneously, transparent pyramids are formed belonging to the quadratic system, and containing 6 molecules of water.

Conine and its Compounds. J. Schorm. (*Ber. der deutsch. chem. Ges.*, xiv., 1765.) The author describes two processes for extracting this alkaloid from hemlock fruits, by which he obtained a larger yield and a purer product than is obtained by the usual methods.

In the first of these processes the fruits are moistened with hot

water and allowed to swell, then treated with 4 per cent. of their weight of sodium carbonate dissolved in water. Caustic alkalies must not be employed. The mixture is then distilled by the aid of steam under a pressure of about three atmospheres, and the distillation continued as long as the distilling liquid shows an alkaline reaction. The distillate, in which the greater portion of the conine separates like an oil, is then acidified with hydrochloric acid and evaporated to a syrupy consistence. When cold this is treated with 2 vols. of strong alcohol, and filtered from the ammonium chloride. The conine is liberated by means of soda from the residue obtained by evaporating the alcoholic solution, and then dissolved out by ether. Conhydrine often separates out from the ethereal solution; this, on evaporation, gives the conine which, after drying over potassium carbonate, is fractionally distilled, 60 per cent. passing over between 168–169°.

The second method consists in exhausting the fruits with water acidulated with acetic acid, and evaporating the extract in a vacuum to the consistence of a syrup. To the product magnesia is then added, and the whole agitated with ether. The residue left upon evaporation of the ether is dried and rectified, as in the first process. By this method a little less alkaloid is obtained, but it is purer, and yields more readily crystallizable salts.

Pure conine is a colourless oily liquid, volatile at the ordinary temperature; it combines with 25 per cent. of its weight of water, which is expelled by heat. It is soluble in 90 parts of water, and is unaltered by light. Its sp. gr. is 0·886.

The author has studied a number of salts of this base, of which the hydrochlorate and hydrobromate had been previously investigated. These two salts are anhydrous, isomorphous, and crystallize in right rhombic prisms.

The hydriodate of conine is anhydrous; it can only be obtained crystalline with perfectly pure hydriodic acid, which is entirely free from iron. This salt crystallizes by slow evaporation, in large flat needles, unalterable by exposure to light and air. It forms oblique rhombohedral prisms. When gently heated in a vacuum it sublimes similarly to sal ammoniac.

The acid tartrate of conine is obtained by the combination of the calculated amount of base and acid; by the spontaneous evaporation of its solution it forms right rhombohedral prisms, containing two molecules of water of crystallization.

The neutral oxalate of conine forms indeterminable crystals, in mamillated groups, and contains no water of crystallization.

The author has also obtained a borate, carbonate, and picrate of conine, and double salts with sulphate of aluminium and chloride of zinc, but these compounds have not been analysed.

Synthesis of Methylconine. MM. Michael and Gundelach. (*Ber. der deutsch. chem. Ges.*, xiv., 1110.) The authors have studied the reactions of paraconine, which Schiff first prepared synthetically from butyl aldehyde and alcoholic ammonia. They prepare it more advantageously from butylidene chloride. The base which they obtain by the treatment of this chloride with methylamine they consider to be identical with the methylconine which Von Planta and Kekulé found occurring in the hemlock along with conine. The authors hope, by the distillation of the hydrochlorate of this base in a stream of hydrochloric acid gas, to obtain conine.

Nicotine, its Specific Gravity and Behaviour towards Water. F. Skalweit. (*Ber. der deutsch. chem. Ges.*, xiv., 1809.) The statements met with in various standard works respecting the specific gravity of this alkaloid are very discordant, the numbers given varying from 1·022–1·048. The author now finds it to be very different from any of those statements, viz., 1·011 at 15° C. He has observed, moreover, that when water is added to nicotine, heat is produced and a diminution in volume takes place, with a corresponding increase in the specific gravity, until a certain limit has been reached. This will be seen from the following:—

Sp. gr. of a mixture of 100 grams of Nicotine with:

5 grams of water	1·017
10 ,, ,,	1·024
20 ,, ,,	1·030
30 ,, ,,	1·034
40 ,, ,,	1·037
50 ,, ,,	1·040
60 ,, ,,	1·038
70 ,, ,,	1·033

These interesting observations lead the author to the supposition that a whole series of bodies may require examination in the same direction. He has already obtained indications that conine suffers a diminution in specific gravity when mixed with water.

Action of Selenium on Nicotine. A. Cahours and A. Etard. (*Comptes Rendus*, xcii., 1079–1084. From *Journ. Chem. Soc.*) When 100 parts of nicotine and 20 parts of selenium are heated together for some time at 240°, and then briskly boiled, the condensing tube becomes filled with white lamellar crystals, which may be sublimed.

When the vapour is heated nearly to redness, it is decomposed into ammonia and selenium. As soon as these crystals cease to form, the heating is discontinued, and the liquid is decanted from the undissolved selenium, and distilled. Oily products pass over above 150°, and a tarry residue is left in the retort. These products are freed from selenium by adding a solution of soda and distilling in a current of steam, the receiver being changed as soon as the distillate becomes distinctly milky. The oily substances are separated from the water by means of ether, and again distilled. In this way *hydrocollidine*, $C_8 H_{13} N$, is obtained as an amber limpid liquid (b. p. 205°), with a penetrating odour and burning taste. It is insoluble in water, but dissolves in alcohol, ether, and dilute acids. From acid solutions potassium hydroxide precipitates hydrocollidine. With iodine it gives a brownish red precipitate, and with mercuric chloride a white precipitate soluble on heating. *Hydrocollidine aurochloride*, $C_8 H_{13} N, H Cl, Au Cl_3$, is a yellow precipitate, which melts in warm water, dissolves at 100°, and is deposited in crystalline plates on cooling. The *platinochloride*, $(C_8 H_{13} N, H Cl)_2 Pt Cl_4$, is an orange-yellow crystalline precipitate, soluble in hot water, from which it is deposited in brilliant plates. The other product of the action of selenium is *isodipyridine*. It is probable that the selenium acts on the nicotine in the same way as sulphur, removing the hydrogen as hydrogen selenide, and forming isodipyridine thus: $C_{10} H_{14} N_2 + Se_2 = 2 Se H_2 + C_{10} H_{10} N_2$. The hydrogen selenide then combines with unaltered nicotine, forming a hydroselenide, which removes one atom of nitrogen in the form of the ammonia-compound described above. When nicotine hydroselenide is subjected to dry distillation, it yields the same products as those obtained by the action of selenium on nicotine. Nicotine when boiled alone does not give off ammonia.

The collidine obtained by passing vapour of nicotine through a red-hot tube boils at 170°, and shows a great tendency to form resinous polymerides. When oxydized by means of permanganate, it yields nicotinic acid, and is therefore one of the propyl-pyridines, corresponding with the isomeric position of nicotinic acid.

Nicotic Acid from Pyridine. O. Fischer. (*Ber. der deutsch. chem. Ges.*, xv., 62–64. From *Journ. Chem. Soc.*) R. Laiblin (*Liebig's Annalen*, cxcvi., 163) suggested that nicotic acid is a pyridinemonocarboxylic acid, and the author has now succeeded in proving this to be the case. Pyridine is converted into a *sulphonic acid* by heating it at 320–330° with 3 to 4 times its weight of pure concentrated sulphuric acid in sealed tubes for a day. The *barium*

salt is made by neutralising with barium hydroxide; it forms colourless needles with silky lustre, and mostly in nodules; is very soluble in water, and contains 4 mols. H_2O, which are driven off at 110°. The *sodium salt* obtained from this forms small indistinct nodules, very soluble in water. Dried at 100°, and mixed with a third part of pure potassium cyanide, and distilled, it yields pyridine, a clear oil which solidifies in the condenser, and finally a small quantity of a high-boiling yellow oil; ammonium carbonate and cyanide are also formed. The distillate is treated with soda, and extracted with ether, and on evaporating the ethereal extract, it leaves a crystalline magma of *pyridine cyanide*, which is purified by recrystallization from light petroleum. It forms aggregations of needles (m. p. 48–49°), easily soluble in water, alcohol, ether, benzene, etc., less so in light petroleum. It volatalises at the ordinary temperature. From a pyridine solution, it can be obtained in brilliant prisms 1 inch long. The hydrochloride crystallizes in colourless needles. The platinochloride forms tufts of slightly yellow needles only moderately soluble in water. Pyridine cyanide is easily saponified by heating it with concentrated hydrochloric acid at 110–112°, producing ammonic chloride and *nicotic acid*. Part of the latter separates out in granules on adding water to the crystalline magma left after driving off the excess of hydrochloric acid; the mother-liquor is concentrated, and the nicotic acid still in solution is separated by treatment with sodium acetate. The acid is purified by recrystallization from water, melts at 228°, sublimes unchanged, and in no way differs from some nicotic acid prepared from quinoline.

Pyridine Bases. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xiv., 1497–1506. From *Journ. Chem. Soc.*) By the action of silver oxide or potassium hydroxide on methylpyridyl iodide, an oily liquid is formed of strong penetrating odour. The best yield of this substance is obtained by making a mixture of the solid iodide and potassium hydroxide into a thick paste with water. An active reaction ensues, and when this abates the mixture is gently heated until all the water is expelled. The oil contained in the aqueous distillate is collected and dried over potassium hydroxide at 100°, air being carefully excluded. The oil has the composition C_6H_9N. It boils at 129°, and combines readily with oxygen, bromine, iodine, and sulphur. The brown gelatinous hydrochloride gives a dirty yellow amorphous precipitate with platinum chloride.

Analogous compounds are obtained by distilling ethylpyridyl- and amylpyridyl-ammonium iodide with potassium hydroxide.

The ethyl derivative boils at 148°, and the amyl derivative at 202°. The amyl derivative dissolves in hydrochloric acid, and is reprecipitated by alkalies. Platinum chloride produces in the hydrochloric acid solution a yellow amorphous precipitate having the composition $2\,(C_{10}H_{17}N.\ H\,Cl)\ Pt.\ Cl_4$.

When a cold aqueous solution of methylpyridyl-ammonium iodide is treated with sodium amalgam, a blue coloration is produced, and an oily liquid is formed which slowly solidifies to a crystalline mass. By adding alcohol to its ethereal solution, it may be obtained in large colourless crystals which decompose spontaneously. This body precipitates metallic silver from a solution of silver nitrate, a methylpyridyl-ammonium salt being formed.

Similar compounds are produced when ethyl- and amyl-pyridyl-ammonium iodides are treated with sodium amalgam. They have not, however, been obtained in the solid state. The compound $C_{24}H_{24}N_2$, which results from the action of sodium amalgam on benzylpyridyl-ammonium chloride is deposited in needles on the addition of alcohol to its ethereal solution.

The formation of this compound may be represented thus:—

$$2\,(C_5H_5N,\ C_7H_7Cl) + H_2 = \\ 2\,H\,Cl + C_7H_7N:\ C_5H_5.\ C_5H_5:\ N.\ C_7H_7.$$

The re-conversion of this body into the original base by the action of nitrate or oxide of silver takes place according to the following equation:—

$$C_7H_7N.\ C_5H_5.\ C_5H_5.\ N\,C_7H_7 + H_2O + Ag_2O - \\ Ag_2 + 2\,(C_5H_5N,\ C_7H_8O).$$

The compounds of the alcoholic iodides with picoline and lutidine, when treated with sodium amalgam or alkalies, behave in the same way as their pyridine homologues.

Some Compounds of Quinine. Z. H. Skraup. (*Monatsh. Chem.*, ii., 610–614.) The combinations described by the author are the following:—*Quinine diethyl-iodide*, $C_{20}H_{24}N_2O_2\ (Et\,I_2) + 3\,H_2O$; *Quinine with cupric acetate*, $C_{20}H_{24}N_2O_2,\ Cu\ (\bar{A}c\,O)_2$; and *Quinine with silver nitrate*, $C_{20}H_{24}N_2O_2,\ Ag\,N\,O_3$. From his investigation of the two last named salts, it appears that they may be regarded as quinine salts, in which 1 atom of hydroxylic hydrogen is replaced by an equivalent quantity of metal, viz., the silver salt as $N\,O_3H,\ C_{20}H_{23}N_2O_2Ag$, and the copper salt as

$$(C_2H_4O_2)\ (C_{20}H_{23}N_2O_2,\ Cu\,C_2H_3O_2).$$

Alleged Synthesis of Quinine. E. A. Maumené. (*Comptes Rendus*, xciv., 968.) The author has handed to the Paris Academy a sealed packet stated to contain synthetically prepared quinine, together with a full description of the process by which it was obtained. Previous to the publication of his method, however, he intends to carry out a series of physiological experiments for the final determination of the identity of the artificial base prepared by him with that contained in cinchona barks.

The Quantitative Estimation of Quinine as Herapathite. A. Christensen. (*Pharmaceut. Zeitschr. für Russland*, xx., 581, and *Pharm. Journ.*, 3rd series, xii., 441.) Dr. de Vrij's method of estimating quinine by means of iodosulphate of quinoidine has been examined by the author, who arrives at the following conclusions:—

1. Acidulated spirit dissolves a notable quantity of herapathite. Too much and too little acid are alike disadvantageous.
2. The concentration of the solution can affect the result.
3. If cinchonidine is present in at all large quantity, periodosulphate of that alkaloid may be precipitated in spite of the precautions recommended by De Vrij.
4. Quinine iodo-compounds are formed richer in iodine than herapathite, unless the solutions are cold and the filtration take place within one hour after precipitation. To avoid the precipitation of iodosulphate of cinchonidine, the author proposes the separation of quinine by ether as far as possible before precipitation.

The Quantitative Estimation of Quinine as Herapathite. Dr. J. E. de Vrij. (*Pharm. Journ.*, 3rd series, xii., 601.) Replying to A. Christensen's criticism (see the foregoing abstract), the author reasserts the accuracy of his method of estimating quinine as herapathite, and cites Professor Jörgensen's opinion in confirmation of his own experience. At the same time he publishes a detailed description of the manipulation of the process, embodying some modifications recently introduced by him in its application.

1. *Preparation of the Iodosulphate of Quinoidine.*—One part of commercial quinoidine is heated on a water-bath with two parts of benzol, whereby the quinoidine is partly dissolved. The cold clear benzol solution is shaken with an excess of weak sulphuric acid, whereby an aqueous solution of the acid sulphate of quinoidine is obtained. After ascertaining in a small part of this solution the amount of amorphous alkaloid contained in it, so that its whole quantity in the solution may be known, the clear solution is poured

into a large capsule. For every 2 parts of amorphous alkaloid contained in the solution, 1 part of iodine and 2 parts of iodide of potassium are dissolved in water. The solution is *slowly* added, *with continual stirring*, to the liquid in the capsule, so that no part of it comes into contact with an *excess* of iodine. By this addition an orange-coloured flocculent precipitate is formed of iodosulphate of quinoidine, which either spontaneously or by a slight elevation of temperature changes into a dark brown-red coloured resinous substance, whilst the supernatant liquor becomes clear and slightly yellow coloured. This liquor, which, if the directions are strictly followed, *must* still contain some amorphous alkaloid, as a proof that no excess of iodine has been used, is poured off, and the resinous substance is washed by heating it on a water-bath with distilled water. After washing the résinous substance is heated on the water-bath till all the water has been evaporated. It is then soft and tenacious at the temperature of the water-bath, but becomes hard and brittle after cooling. One part of this substance is now heated with 6 parts of alcohol of 92 to 95 per cent. on a water-bath, and is thus dissolved and the solution allowed to cool. In cooling a part of the dissolved substance is separated. The clear dark brown-red coloured solution is evaporated on a water bath, and the residue dissolved in 5 parts of *cold* alcohol. This second solution leaves a small part of insoluble substance. The clear dark brown-red coloured solution obtained by the separation of this insoluble matter, either by decantation or filtration, constitutes the reagent which the author has found to answer so well both for the qualitative and quantitative determination of the *crystallizable* quinine in barks.

2. *Application of the Reagent.*—To determine the quantity of quinine contained in the mixed alkaloids obtained from a cinchona bark, 1 part of these alkaloids is dissolved in 20 parts of alcohol of 92 to 95 per cent., containing 1·5 per cent. of H_2SO_4, to obtain an alcoholic solution of the acid sulphates of the alkaloids, and this solution is diluted with 50 parts of pure alcohol. From this solution the quinine is separated *at an ordinary temperature* by adding carefully, by means of a pipette, the above-mentioned solution of iodosulphate of quinoidine as long as a dark brown-red precipitate of iodosulphate of quinine (herapathite) is formed. As soon as all the quinine has been precipitated, and a slight excess of the reagent has been added, the liquor acquires an intense yellow colour. The beaker containing the liquor with the precipitate is now covered by a watch-glass, and heated till the liquid begins to

boil and all the precipitate is dissolved. The beaker is then left to itself, and in cooling, the herapathite is separated in the well-known beautiful crystals. After twelve hours' rest, the beaker is weighed to ascertain the amount of liquid, which is necessary in order to be able to apply later the necessary correction, for although the quinine-herapathite is very slightly soluble in cold alcohol, it is not insoluble. The clear liquid is poured off as far as possible on a filter, eaving the majority of the crystals in the beaker, which is now weighed again to ascertain the amount of liquid, which is noted down. The few crystals on the filter are now washed down in the beaker, and as much alcohol added as is necessary to redissolve all the crystals at the boiling point. The object of this redissolving is to be alsolutely certain that by surface attraction no trace of iodo-sulphate of cinchonidine has adhered to the crystals of herapathite; for these traces, if present, will remain dissolved after the recrystallization. After perfect cooling, the weight of the beaker is ascertained again, the crystals of herapathite carefully collected on a small filter, and the empty beaker again weighed. The difference in weight will indicate the amount of liquor which is added to that of the first liquor, and from the sum of this addition the necessary correction is calculated. If the operation is effected at a temperature of 16° C., the weighed quantity of the two combined liquors will indicate the correction if multiplied by 0·125 and divided by 100. If the temperature be lower or higher, the solubility of herapathite at that temperature must be ascertained by experiment, which can easily be performed by a standard solution of hyposulphite of sodium, as 21·58 parts of iodine found by this reagent indicate 100 parts of herapathite. The herapathite collected on the filter is thoroughly washed with a saturated alcoholic solution of pure herapathite, and after this washing is completed the liquid retained by the crystals is expelled as much as possible by slightly knocking the sides of the funnel. The filter is then taken from the funnel and laid upon blotting paper, often renewed, to take away as quickly as possible the still adhering liquid. As soon as the filter is air-dry the crystals of herapathite can be completely removed from the filter and dried on a water-bath in a couple of large watch glasses closing tightly upon each other, so that the weight of the substance contained in the glass may be taken without excess of air. If after repeatedly weighing the weight remains constant, it is noted down, and to it is added the product of the calculated correction. The sum of this addition is the total amount of iodosulphate of quinine obtained from the mixed alkaloids subjected to

analysis, and from this weight the amount of quinine can be calculated by the use of Jörgensen's formula,—

$$4\,C_{20}\,H_{24}\,N_2\,O_2,\ 3\,H_2\,SO_4.\ 2\,H\,I.\ I_4.$$

According to this formula, 1 part of herapathite dried at 100° C., represents 0·55055 part of pure anhydrous quinine.

Sulphophenate of Quinine. S. Zinno. (*Annali di Chimica*, lxxiv., 282. From *Pharm. Journ.*) The author first discusses the question as to whether "sulphophenate" or "phenosulphate" is the better name for this salt, and decides in favour of the former, for the more stable and important of atomic groups forming the double acid is the sulphuric molecule. The acid from which this salt is formed is a substitution-product of sulphuric acid, in which one of the hydrogen atoms is replaced by a molecule of phenyl, thus, $\left.\begin{matrix} H \\ C_6\,H_5 \end{matrix}\right\}\,S\,O_4$.

This salt appears to have been first prepared by Prota-Giurleo, and analysed by the author in 1870, although Rademaker is generally stated to have been the discoverer. It is a true chemical compound, and possesses all the chemical and physical characteristics of a definite body. It contains 52 per cent. of quinine, 20 per cent. of sulphophenic acid, and 28 per cent. of water of crystallization.

Sulphophenic acid is made by treating phenol with excess of strong sulphuric acid, allowing the mixture to remain for twenty-six hours. It is then diluted with water, and saturated with barium carbonate, filtered and evaporated, the resulting barium salt being purified by recrystallization from alcohol; it is then decomposed by sulphuric acid, and the liberated sulphophenic acid added to an equivalent proportion of the alkaloid. Or the crude acid may be saturated with carbonate of lead, filtered, and the resulting solution of sulphophenate of lead decomposed with quinine. The salt is very difficult to crystallize, and should be dispensed in the form of an accurately titrated solution.

The salt is being much used in Italy in medical practice, and its efficacy is highly spoken of by the author.

Constitution of Cinchonine. W. Koenigs. (*Ber. der deutsch. chem. Ges.*, xiv., 1852–1859. From *Journ. Chem. Soc.*) At the outset the author gives a brief historical account of the various researches which have thrown light on the constitution of the cinchona alkaloids and their derivatives. On the constitution of the cinchonine two opposed views have been held, according to one of which cinchonidine contains two chinoline residues. But as the de-

composition of cinchonine into ethylpyride, chinoline, and fatty acids is difficult to reconcile with this view, Wischnegradsky has proposed the formula $C_9 H_7 Me N . C O . C_2 H_4 . C_5 H_5 Et N$. The author, however, believes that this decomposition can be explained by the violent action of the melted alkali on a reduced chinoline residue, and that the supposition of the chinoline residues in cinchonine is not therefore untenable. In order to decide this question, he has conducted a series of reactions which, although not conclusive, yet point to the presence in cinchonine of two chinoline residues, one a tetra-hydrochinoline, the other a methyltetrahydrochinoline. By the action of phosphorus pentachloride on cinchonine hydrochloride, the author has obtained a cinchonine chloride, $C_{19} H_{21} N_2 Cl$. By heating this latter compound with alcoholic potash, a new base ($C_{10} H_{20} N_2$), *cinchene*, is obtained, which crystallizes in the rhombic system (m. p. 123–125°). By the action of nitric acid on cinchene at 220°, a gas burning with a green flame was obtained, probably methyl chloride. This renders it probable that there is in cinchene and cinchonine a $C H_3$-group attached to a nitrogen atom. The production of formic acid by the gradual oxidation of cinchonine and quinine by permanganate lends additional support to this view. By heating cinchene with hydrochloric acid, a golden crystalline, sparingly soluble hydrochloride of a new base, *apocinchene*, $C_{18} H_{17} N O$, is obtained. Apocinchene has the character of an amidophenol; it crystallizes from hot alcohol, and melts at 209°. By oxidation with chromic mixture, apocinchene gives cinchonic, carbonic, and some small quantity of acetic acid. In the formation of apocinchene, the ethylpyridene residue of cinchene has probably given off its nitrogen in the form of ammonia or methylamine, a view which is in accordance with the experiments of Hoogewerff and Van Dorp on the oxidation of the cinchona alkaloids with alkaline permanganate, whereby half the nitrogen was evolved as ammonia, and half appeared in the pyridenetricarboxylic acid. It is further probable, from a consideration of Hofmann's experiments on the methylated derivatives of pyridene and conine, that cinchene and apocinchene contain, besides a chinoline nucleus, a reduced pyridene residue, which has a methyl group attached to a nitrogen atom of a tertiary amine. As nitrous acid has no action on cinchene, cinchonidene, and quinine, it is probable that both the nitrogen-atoms belong to a tertiary amine grouping. Apocinchene, from its analogy with amidophenol, contains a hydroxyl grouping possessing acid properties.

By fusing apocinchene with potash, a new base, *oxyapocinchene*,

$C_{18}H_{17}NO_2$, is obtained, which can be crystallized from hot alcohol, and melts at 267°. Cinchonine differs from cinchene by a molecule of water, and those bases appear to bear to one another a relation similar to that existing between camphor and cymene. The author promises further researches, with a view of establishing the constitution of cinchonine and the substances derived from it, which are described in the present communication.

Cinchonidine and Homocinchonidine. A. Claus and H. Weller. (*Ber. der deutsch. chem. Ges.*, xiv., 1921–1924.) Like Skraup, the authors are of opinion that the existence of cinchonidine and homocinchonidine as two distinct alkaloids has not yet been fully established, and that the difference in physical properties of the two substances may arise from the presence of impurities.

Cinchonidine and Homocinchonidine. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xiv., 1888–1895.) In opposition to the views of Skraup, and also to those of Claus and Weller (see the preceding abstract), the author reasserts the existence of cinchonidine and homocinchonidine as perfectly distinct bodies, and supports his assertion by a reinvestigation of these two alkaloids and their sulphates, the results of which will be found fully described in the original paper.

Quinamine. Dr. O. Hesse. (*Liebig's Annalen*, ccvii., 288–308. From *Journ. Chem. Soc.*) The author has previously shown that quinamine exists in the barks of *Cinchona succirubra*, *C. officinalis*, *C. Calisaya*, var. *javanica*, and *C. Calisaya*, var. *ledgeriana*. The last mentioned contains large quantities of the alkaloid. The author finds that the crude mother-liquor of quinine sulphate contains a considerable amount of quinamine. The substance which he has employed in his researches was derived from this source. 200 kilos. of mother-liquor yield 150 grams of quinamine and 30 grams of conquinamine.

Preparation of Quinamine.—After the alkaloids precipitable by sodium potassium tartrate have been removed, and the cinchonine for the most part separated by precipitating with ammonia and washing the precipitate with ether, in which it is scarcely soluble, the ethereal solution is poured into acetic acid. This solution is neutralised, and then, when warm, potassium thiocyanate is added until, on cooling, cinchonine can no longer be detected. Conquinine then comes down, together with the colouring matter. The clear solution is next treated with sodium hydroxide, and the resinous mass so obtained dissolved in the requisite quantity of 80 per cent. alcohol, from which, on cooling, quinamine is ob-

tained in a crystalline state. After recrystallization and treatment with animal charcoal, it is obtained quite pure. Its formula is $C_{19}H_{24}N_2O_2$. It is a mono-acid base.

Quinamine hydrochloride, $C_{19}H_{24}N_2O_2HCl + H_2O$, forms hard colourless prisms, which dissolve somewhat easily in cold water, less easily in dilute hydrochloric acid.

Quinamine platinochloride, $(C_{19}H_{24}N_2O_2)_2PtCl_6H_2 + 2H_2O$. The author's recent analyses of this salt agree with those previously made by him (*Annalen*, cxcix., 336), and he therefore concludes that it contains 2 mols. H_2O. Oudemans, however, found a larger percentage of water.

Quinamine hydrobromide, $C_{19}H_{24}N_2O_2HBr + H_2O$, is prepared by mixing an alcoholic solution of quinamine with hydrobromic acid, and evaporating the solution. It crystallizes in hard colourless prisms, which are easily soluble in water, and still more so in alcohol.

Neutral quinamine oxalate forms hard colourless needles, which are difficult to separate from an admixed amorphous portion.

Acid quinamine sulphate is obtained as a yellow uncrystallizable residue, which is very soluble in water and alcohol.

Quinamine benzoate, salicylate, and quinate, are all obtained by mixing the acids with the base in molecular proportions. None of them have been obtained crystalline.

Action of Acetic Anhydride on Quinamine.—When quinamine is heated at 60–80° for several hours with acetic anhydride, 1 mol. of water is given off, and an atom of hydrogen is displaced by acetyl acetyl-apoquinamine being formed.

Action of Ethyl Iodide.—Quinamine dissolves in alcoholic ethyl iodide solution, and on evaporation an amorphous residue is obtained, which dissolves in water on continued boiling. On allowing this solution to cool, quinamine hydriodide crystallizes out.

Action of Acids.—Quinamine decomposes readily in an acid solution. The final product, however, varies with the proportions of acid and base employed.

1. One part of an alcoholic solution of quinamine, of sp. gr. 1·125, when heated for three minutes with twenty parts of acid, yields apoquinamine. The solution on continued boiling gives a brown substance, which is extremely insoluble in dilute hydrochloric acid.

2. If heated with concentrated acid in sealed tubes for some hours at 140°, it is transformed into a caoutchouc-like mass, which is insoluble in all the ordinary solvents.

3. If, on the other hand, a mixture of quinamine (1 part) and 13 per cent. hydrochloric acid (10 parts) is allowed to stand for some time, *quinamidine*, mixed with a red oil, separates out. This last alkaloid is also formed when quinamine is heated at 130° in sealed tubes with 1–4 mols. of hydrochloric acid, 1 or 2 mols. of tartaric acid, 2 mols. of quinic acid, or 2 mols. of acetic acid, in the proportion of 1 part of alkaloid to 5 parts of acid. Quinamicine is formed as a bye-product. Quinamidine is also obtained by continued boiling of a solution of quinamine in dilute sulphuric acid (1 part of acid to 10 of water), connected with an inverted condenser. Under similar circumstances a mixture of 1 part of acid and 3 parts of water yields apoquinamine.

Apoquinamine, $C_{19}H_{22}N_2O$, as obtained in the preceding manner, is purified by dissolving it in acetic acid, boiling with animal charcoal, and reprecipitating with ammonia. The alkaloid crystallizes from an alcoholic solution in colourless plates (m. p. 114° uncorr.), which contain no water of crystallization. Another method of obtaining the substance pure is by heating acetyl-apoquinamine for a few minutes with hydrochloric acid of sp. gr. 1·125. Apoquinamine is thus formed, and on converting it into the neutral oxalate, and crystallizing from alcohol, it is obtained quite pure. It dissolves in concentrated sulphuric and hydrochloric acids with a greenish yellow colour, which changes to brownish yellow on heating. With dilute hydrochloric acid it yields a colourless solution. From acid solutions it is precipitated by alkalies in the form of a white powder, at first flocculent, but afterwards crystalline. *Apoquinamine hydrochloride*, $C_{19}H_{22}N_2O, HCl + \frac{1}{2}H_2O$, is obtained crystalline by mixing the base and hydrochloric acid in molecular proportions in alcohol, and allowing the solution to evaporate.

The *platinochloride*, $(C_{19}H_{22}N_2O)_2PtCl_6H_2 + 2H_2O$, is a yellow powder. The *aurochloride* is a yellow flocculent precipitate. The *hydrobromide* resembles the hydrochloride. The *neutral sulphate*, $(C_{19}H_{22}N_2O)_2SO_4H_2 + 2H_2O$, is obtained in similar manner to the hydrochloride: it forms white needles. The *neutral oxalate*, $(C_{19}H_{22}N_2O)_2C_2O_4H_2 + H_2O$, is prepared like the hydrochloride: it forms short thick prisms. The *nitrate*, $C_{19}H_{22}N_2O.NO_3H$, is obtained in hard granular anhydrous crystals, which are only very slightly soluble in water, but dissolve easily in alcohol. The *tartrate*, $(C_{19}H_{22}N_2O)_2C_4H_4O_6 + xH_2O$, crystallizes in star-shaped groups of colourless prisms, which dissolve easily in alcohol, but little in cold water. The *quinate*, $C_{19}H_{22}N_2O.C_7H_{12}O_6 + xH_2O$, crystallizes in beautiful colourless prisms. The *salicylate* forms an

amorphous easily fusible mass. The *perchlorate*, obtained by dissolving the alkaloid in perchloric acid, forms a colourless oil.

Acetyl-apoquinamine, $C_{19}H_{21}\bar{A}cN_2O$, is obtained by heating the alkaloid with acetic anhydride. The *platinochloride*, $(C_{19}H_{21}\bar{A}c N_2O)_2PtCl_6H_2 + 2H_2O$, is an orange-yellow amorphous powder. The *aurochloride* has a similar appearance.

Quinamidine, $C_{19}H_{24}N_2O_2$.—The best method of preparing this body is as follows:—4 grams of quinamine are heated at 130° in a sealed tube with 2 grams of tartaric acid and 18 grams of water for two hours. The tube is then opened, and while the mixture is still warm a saturated solution of sodium chloride is added until it becomes milky. On allowing the mixture to remain at rest, quinamidine hydrochloride separates out, mixed with a certain amount of sodium tartrate. It is purified by precipitating with sodium hydroxide and crystallizing from alcohol, when the free base is obtained in small white needles in cauliflower-like clusters (m. p. 93°, uncorr.). It is an isomeride of quinamine, which it resembles in giving a purple-red precipitate with gold chloride; it differs from it, however, in not yielding apoquinamine when treated with concentrated hydrochloric acid. It is a much stronger base than quinamine. It dissolves in concentrated hydrochloric and sulphuric acids with a saffron-yellow colour. The solution in the former acid becomes brown on warming; if it be then poured into cold water it yields a rose-coloured solution with a green fluorescence. The *hydrochloride*, $C_{19}H_{24}N_2O_2, HCl + H_2O$, crystallizes in hard colourless prisms, which are readily soluble in hot water and in alcohol, but insoluble in sodium chloride solution. The salt effloresces in dry air. The *platinochloride*, $(C_{19}H_{24}N_2O_2)_2PtCl_6H_2 + 6H_2O$, is a pale yellow precipitate, which changes to dark red on standing. The *hydrobromide*, $C_{19}H_{24}N_2O_2.HBr + H_2O$, crystallizes in colourless prisms. The *neutral oxalate*, $(C_{19}H_{24}N_2O_2)_2C_2O_4H_2$, is obtained by mixing alcoholic solutions of the base and acid in molecular proportions.

Quinamicine, $C_{19}H_{24}N_2O_2$.—This body is formed in small quantities, together with quinamidine, when quinamine is heated with acids. It is formed in larger quantities when an alcoholic solution of the base and sulphuric acid is evaporated at 60–80°, and the residue so obtained is heated for a few minutes at 100°. A better yield is procured when a drop of glycerol is added to the mixture. The base is freed from admixed quinamidine by repeatedly dissolving it, first in cold water, then in acetic acid, and precipitating with sodium bicarbonate. This treatment is continued until a small

quantity of the alkaloid dissolved in hydrochloric acid gives a yellow precipitate with gold chloride, which does not change on standing for some hours. When pure, the crystals melt at 109° (uncorr.). The *hydrochloride* is obtained in a crystalline form by adding a small quantity of hydrochloric acid to a solution of the base in the same acid, and allowing the liquid to evaporate. The *platinochloride* $(C_{19}H_{24}N_2O_2)_2PtCl_6H_2 + 3H_2O$, is a yellow flocculent precipitate.

Proto-quinamicine, $C_{17}H_{20}N_2O_2$.—This substance is obtained by heating the compound composed of equal molecules of quinamicine and sulphuric acid for a short time at 120–130°. The mass becomes dark brown, and almost insoluble in water, while the original substances were freely soluble. It is purified by dissolving it in acetic acid and precipitating with ammonia. The *platinochloride* $(C_{17}H_{20}N_2O_2)_2PtCl_6H_2$, is a brown flocculent precipitate, which when dried in the air becomes black.

The author gives the following table of the rotatory powers of the preceding alkaloids. *P* is the weight of substance in 100 c.c.; *A* is the rotatory power $[\alpha]_D$ of the substance dissolved in 97 per cent. alcohol; *W*, of the substance dissolved in water and known quantities of hydrochloric acid; *N* is the amount of acid expressed in molecules.

Name of Substance.	P.	A.	P.	N.	W.
Quinamine, $C_{19}H_{24}N_2O_2$ . . .	2	+105·5°	2	1	+116·0°
	—	—	2	3	+117·1
Quinamine hydrochloride, $C_{19}H_{24}N_2O_2$, $HCl+H_2O$	2	+118·1	2	0	+100·0
Quinamine hydrobromide, $C_{19}H_{24}N_2O_2$, $HBr+H_2O$	—	—	4	0	+88·2
Quinamidine, $C_{19}H_{24}N_2O_2$ . . .	2	+4·5	—	—	—
Quinamidine hydrochloride, $C_{19}H_{24}N_2O_2$, $HCl+H_2O$	—	—	2	0	0
Quinamicine	2	+38·1	2	3	+47·0
Apoquinamine, $C_{19}H_{22}N_2O$ . .	2	0	2	$1\frac{1}{10}$	−28·4
	—	—	2	3	−29·1
	—	—	2	10	−30·0
Acetyl-apoquinamine, $C_{19}H_{21}AcN_2O$	2	0	2	10	−31·2

Conquinamine. A. C. Oudemans. (*Liebig's Annalen*, ccix., 38–61. From *Journ. Chem. Soc.*) A continuation of the author's researches on the alkaloids of the "quinetum of Darjeeling." In order to separate conquinamine and quinamine from the crude products, the quinine and cinchonidine are removed by precipitation as tartrates, and the filtrate precipitated by potassium hydroxide. This precipitate is boiled with 50 per cent. alcohol, and from the

filtered liquid there separates on cooling a mixture of cinchonine, quinamine, and conquinamine (quinidine may be precipitated as thiocyanate from the filtrate from this mixed precipitate). These mixed alkaloids are shaken up with ether to remove the cinchonine, and the residue is dissolved and subsequently recrystallized slowly from 60 per cent. alcohol. The crystals are then separated by a fine metallic sieve which retains the larger crystals of the conquinamine. Quinamine and conquinamine, however, are better separated from one another by fractional crystallization of their nitrates, oxalates, or hydrobromides, these conquinamine salts being less soluble than those of quinamine. Pure conquinamine is obtained by precipitating the nitrate with caustic soda, dissolving the precipitated alkaloid in alcohol, and recrystallizing.

Conquinamine forms colourless to golden yellow transparent crystals of the tetragonal system (m. p. 123°), easily soluble in alcohol, ether, benzol, and chloroform, sparingly soluble in water. The specific rotatory power was determined in various solutions of the alkaloid in alcohol, ether, chloroform, and benzene.

Solvent.	Conquinamine in 100 c.c.	$[\alpha]_D$.
Absolute Alcohol	0·8025 grams	+205·1
	2·7115 „	202·6
	4·0180 „	204·1
Ether	0·7655 „	192·7
	1·6115 „	189·0
	4·6460 „	190·3
Chloroform	0·7945 „	176·1
	1·5310 „	173·8
	3·0500 „	171·2
Benzene	0·8955 „	180·1
	2·1285 „	178·6
	3·4470 „	178·0

From these results it appears that the specific rotatory power of conquinamine in alcoholic and ethereal solution, at first decreases with greater concentration, but subsequently increases.

The results of analyses agree with the formula $C_{19}H_{24}N_2O_2$, assigned to conquinamine by Hesse.

The reactions of conquinamine with platinic chloride, sulphuric and nitric acids, and the higher acids of chlorine, resemble those of quinamine.

Conquinamine sulphate, $(C_{19}H_{24}N_2O)_2, H_2SO_4 + x Aq$, is very soluble in water; it is obtained from alcoholic solution in slender needles.

Conquinamine hydrochloride, $C_{19}H_{24}N_2O_2$, $HCl + x Aq$, is very soluble in water; on evaporation, it separates out as an amorphous mass, with signs of crystallization.

Conquinamine hydrobromide, $C_{19}H_{24}N_2O_2HBr$, crystallizes in monoclinic crystals of combination $\infty P : -P : \infty P \infty$. Specific rotation of a solution of salt in alcohol (1·162 grams in 100 c.c.) $[\alpha]_D = +182·7$, and of the alkaloid in the form of hydrobromide $[\alpha]_D = +228·1$.

Conquinamine hydroiodide, $C_{19}H_{24}N_2O_2$, HI, crystallizes in leaflets. Specific rotation of salt in alcohol (1·011 gram in 100 c.c.) $[\alpha]_D = +162·8$, and of the alkaloid in the form of hydroiodide $[\alpha]_D = +229·5$.

Conquinamine nitrate, $C_{19}H_{24}N_2O_2$, HNO_3 crystallizes in the rhombic system. Combination O P: P. Specific rotation of salt in alcohol (1·2685 gram in 100 c.c.) $[\alpha]_D = +190$, and of the alkaloid in the form of nitrate $[\alpha]_D = +228·6$.

Conquinamine chlorate, $C_{19}H_{24}N_2O_2$, $HClO_3$, crystallizes in monoclinic needles. Specific rotation of salt in alcohol (·9150 gram in 100 c.c) $[\alpha]_D = +184$, and of the alkaloid as chlorate $= +234$.

Conquinamine perchlorate, $C_{19}H_{24}N_2O_2$, $HClO_4$, crystallizes in long needles of the monoclinic system. Specific rotation of salt in alcoholic solution (·71 gram in 100 c.c.) $[\alpha]_D = +175·4$, and of the alkaloid as perchlorate $[\alpha]_D = +231·4$.

Conquinamine platinochloride, $(C_{19}H_{24}N_2O_2, HCl)_2$, $PtCl_4 + 3H_2O$, forms an orange-golden amorphous precipitate, which is slowly decomposed by water, forming a rose-coloured solution.

Conquinamine formate crystallizes in the monoclinic system, the *acetate* in the tetragonal, and the *oxalate* in the rhombic system. On heating this last salt to 115° it darkens, and on dissolving the mass in acidified water, and precipitating with soda, a compound differing from the original conquinamine is thrown down (probably the apoquinamine of Hesse).

The author has studied the influence of excess of various acids on the specific rotatory power of conquinamine, and has arrived at results similar to those obtained with quinamine, viz., that the specific rotatory power reaches its maximum when 1 mol. of a monobasic, or $\frac{1}{2}$ mol. of a bibasic acid is added to 1 mol. of the alkaloid. Therefore, the alkaloid, like quinamine, is monobasic. It also appears probable that, as the specific rotatory powers of the alkaloid existing as salts of organic acids do not agree with those of the salts of the inorganic acids, the organic acid salts are partially decomposed in solution.

Conquinamine. Dr. O. Hesse. (*Liebig's Annalen*, ccix., 62–69.) The author has previously observed in the alcoholic mother-liquor obtained in working up the barks of the *Cinchona succirubra*, the presence of an alkaloid, *conquinamine*. The method of separating this alkaloid does not essentially differ from that adopted by Oudemans (see preceding abstract). The pure alkaloid is obtained by precipitating the nitrate with ammonia, and is purified by recrystallization from 60 per cent. alcohol. It crystallizes in tough prisms (m. p. 121°). The analyses agree with the formula $C_{19}H_{24}N_2O_2$. On heating with hydrochloric acid (sp. gr. = 1·125), it is decomposed into apoquinamine and water, thus: $C_{19}H_{24}N_2O_2 = C_{19}H_{22}N_2O + H_2O$. Conquinamine resembles quinamine in all its chemical properties.

Conquinamine Hydrochloride.—Contrary to the observation of Oudemans, the hydrochloride may be obtained in octahedral crystals: on precipitating an aqueous solution of this salt with sodium platinochloride, a golden flocculent precipitate is thrown down of the *platinochloride* of the alkaloid, $(C_{19}H_{24}N_2O_2)_2, PtCl_6H_2 + 2H_2O$. With auric chloride, the hydrochloride gives a golden precipitate, which rapidly becomes purple; mercuric chloride and potassiomercuric iodide form white flocculent precipitates.

Conquinamine quinate, $C_{19}H_{24}N_2O_2 . C_7H_{12}O_6 + 2H_2O$, crystallizes in long colourless prisms, easily soluble in alcohol and water.

The neutral oxalate when heated to 105° is converted first into quinamicine and then into apoquinamine oxalate, thus:

$$(C_{19}H_{24}N_2O_2)_2, C_2H_2O_4 = (C_{19}H_{22}N_2O)_2, C_2H_2O_4 + 2H_2O.$$

The author made the following observations of the rotatory power of conquinamine (t = 15):—

P.	Solvent.	$[\alpha]_D$.
2	97 per cent. alcohol .	+204·6
2	Chloroform . .	184·5
2	Water + 1 mol. HCl .	229·1
4	Water + 3 mols. HCl .	230·0
4 Conquinamine hydrochloride	Water . . .	205·3

The author observes that conquinamine shows the same specific rotatory power in acid as in neutral solutions, but cannot accept Oudemans' view that this phenomenon is correlated with the basicity of the alkaloid. Thus, for instance, hydrochlorapocinchonine has the same specific rotatory power in acid and neutral solutions, but yet is undoubtedly a bi-acid base.

The author also alludes to the fact that the difference of specific rotatory power of quinamidine and quinamine in 97 per cent. alcohol is half as great as that between quinamidine and conquinamine. This fact lends support to the second law of Krecke, recently elaborated by Thomsen (*Ber. der deutsch. chem. Ges.*, xiii., 2267). The author arrives at the conclusion that conquinamine and quinamine are two isomeric bases, which cannot, however, be converted directly one into the other.

Cinchamidine. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xiv., 1683.) The name *cinchamidine* is applied by the author to a new alkaloid discovered by him in the aqueous mother-liquors from the purification of homocinchonidine sulphate. It is obtained by adding ammonia to these liquors, collecting the precipitate thus formed, recrystallizing it repeatedly from hot alcohol, purifying it by fractional precipitation with sodium tartrate from its hydrochloric acid solution, next dissolving the precipitated cinchamidine in sulphuric acid, removing impurities by treating the solution with a small quantity of potassium permanganate, then re-precipitating it by ammonia, and finally recrystallizing this precipitate from alcohol.

The composition of this new base is represented by the formula $C_{20}H_{26}N_2O$. It crystallizes in colourless scales and flat needles, or from strong alcohol in short thick prisms, fusing at 230° C. It is lævogyre (−98·4°), not fluorescent in acid solutions, and does not yield a green coloration with chlorine water and ammonia. It is frequently present in commercial cinchonidine.

Cinchotine, Hydrocinchonidine, and Hydroquinidine. C. Frost and C. Böhringer. (*Ber. der deutsch. chem. Ges.*, xiv., 1266 and 1954.) Cinchotine is formed by the oxidation of cinchonine with potassium permanganate. Fractional crystallization of the sulphates affords the readiest means of separating cinchotine and cinchonine from each other.

Pure cinchonidine, when treated with potassium permanganate, yields cinchotenidine, and a new alkaloid, *hydrocinchonidine*, which bears the same relation to cinchonidine as cinchotine does to cinchonine. It crystallizes in needles fusing at 225° C., and differs from cinchotine by its lævo-rotatory action on polarised light, and its greater solubility in alcohol.

The new base, to which the author applies the name *hydroquinidine*, is formed by the action of potassium permanganate on quinidine. Upon evaporating the alcoholic solution of the crude product, a crystalline crust is obtained, which, upon washing with

ether and recrystallizing from alcohol, yields the alkaloid in the form of prismatic crystals, corresponding to the formula $C_{20} H_{26} N_2 O_2 + 2\frac{1}{2} H_2 O$. Its alcoholic solution is dextrogyre. Its solution in dilute sulphuric acid exhibits a blue fluorescence, and produces a dark green coloration with chlorine water and ammonia. The crystals are but sparingly soluble in ether.

Hydrocinchonidine and Cinchamidine. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xv., 854.) The author arrives at the conclusion that the alkaloid described by Forst and Böhringer, under the name of *hydrocinchonidine* (see the preceding abstract), is identical with his (Dr. Hesse's) cinchamidine. It agrees with the latter in all its properties; and while it is easily obtained from commercial cinchonidine, not a trace is yielded by really pure cinchonidine.

Hydroquinidine and Hydroquinine. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xv., 854.) From the mother-liquors of the sulphates of quinidine (conchinine) and quinine, the author has obtained fractions which in the one case were rich in hydroquinidine and in the other in hydroquinine. For the former he confirms the formula $C_{20} H_{26} N_2 O_2 + 2\frac{1}{2} H_2 O$; while to the latter he assigns the formula $C_{20} H_{26} N_2 O_2$. Both produce with chlorine and ammonia the same coloration as quinine.

Cincholine. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xv., 854.) If Rochelle salt and sulphocyanide of potassium be added successively to the mother-liquor first obtained in the preparation of quinine sulphate, until the latter no longer produces a precipitate, the light yellow solution supersaturated with caustic soda, and the alkaloid set free extracted by shaking the liquor out with ether; the ether leaves upon evaporation a brown mobile residue having a peculiar odour. Upon boiling with water the volatile bases present pass off from this residue, and can be suitably collected in dilute hydrochloric acid. The solution is then evaporated, the residue mixed with caustic soda solution and extracted with ether. After the ethereal solution has been repeatedly washed with water, solution of oxalic acid in ether is added to it drop by drop, and the chinoline oxalate is precipitated as a pasty mass, which quickly changes into shining laminæ.

Cincholine, separated from the oxalate by means of caustic soda, is a pale yellow oil, having a strong basic reaction, lighter than water, and with a faint peculiar smell. It dissolves freely in ether, alcohol, and chloroform, less so in water, and scarcely at all in soda solution. It can be distilled, especially in the vapour of water,

is not coloured by chloride of lime, and dissolves freely in hydrochloric acid, which it is capable of neutralizing. The neutral solution is tasteless, and upon evaporation the hydrochlorate separates in colourless, mostly four-sided scales. With gold and platinum chlorides it gives only resinous precipitates. Cincholine forms with oxalic acid a salt very sparingly soluble in water.

Oxidation-Products of Cinchona Alkaloids. Z. H. Skraup. (*Monatsh. Chem.*, ii., 587–609.) The author has previously shown that quinine, cinchonine, and cinchonidine, when suitably treated with potassium permanganate, all give up one carbon atom in the form of formic acid, and are converted into weak bases of a phenolic character, known as cinchotenidine, cinchotenine, and quitenine respectively. The same resemblance also extends to quinidine, which, under the same conditions, yields formic acid and a base analogous to, and probably identical with, quitenine.

By oxidation with chromic acid, both quinine and quinidine yield *quininic acid*, $C_{11} H_9 N O_3$, a body homologous with cinchoninic acid. A close study of this acid and some of its compounds and derivatives, the results of which are fully detailed in the original paper, leads the author to the conclusion that the acid in question is a carboxylated and methoxylated derivative of quinoline.

The Physiological Action and Chemical Reaction of Chinoline. J. Donath. (*Pharm. Journ.*, 3rd series, xii., 279 and 317.) Some time ago the author called attention to the antipyretic and antiseptic action of chinoline (*Ber. der deutsch. chem. Ges.*, xiv., 178). At a meeting of the Materia Medica Section of the International Medical Congress, he stated that the tartrate of chinoline, in the proportion of 0·2 per cent. completely prevents the lactic fermentation of milk, decomposition of urine and gelatine, and the development of bacteria in artificial cultivating fluid, and that it is superior in antiseptic power to sodium salicylate, quinine, boracic acid, salicylic acid, copper sulphate, and alcohol. Even in concentrated solution it does not precipitate albumen, and in the proportion of 0·4 per cent. it prevents the putrefaction of blood and the curdling of milk. In the proportion of 1 per cent. it completely destroys the coagulability of the blood. Taken internally it lowers the temperature in fever, is useful in periodic neuralgia, and is an excellent local antiseptic. The dose for adults is one or two grams dissolved in equal parts of syrup and water. Children take it easily. It is said not to cause any unpleasant after-effects, such as giddiness and tinnitus. A further communication on the subject from the author appears in the *Berichte* (xiv., 1769), from which it

appears that chinoline, even in considerable quantity, does not affect the alcoholic fermentation, and is remarkably inactive towards yeast cells, a property that, notwithstanding statements to the contrary by Liebig and others, appears to be shared by quinine.

The antipyretic and antiseptic properties of chinoline have already brought it into medicinal use, and therefore the following information as to some easily carried out reactions for testing the purity of the preparation, or detecting it in excrement, etc., may be useful.

Chinoline salt in aqueous solution is precipitated milky-white by potash ley. The precipitate dissolves with difficulty in excess of the precipitant, easily in ether, benzine, and alcohol, and somewhat less readily in carbon bisulphide, chloroform, and amylic alcohol.

Sodium carbonate also precipitates chinoline white, with solution of carbonic anhydride; the precipitate is insoluble in excess.

Ammonia produces a white precipitate, but this is tolerably easily soluble in excess. Ammonium carbonate behaves similarly.

Solution of iodine in iodide of potassium (potassium iodide 7 parts, iodine 5 parts, water 100 parts) produces a red-brown precipitate insoluble in hydrochloric acid. Limit of the reaction: 1 in 25,000.

Phosphomolybdic acid (10 parts of sodium phosphomolybdate in 100 parts of water, and nitric acid added up to a strongly acid reaction) gives, with solution of chinoline salt to which nitric or hydrochloric acid has been added, a yellowish white precipitate, which readily dissolves colourless in ammonia. Limit of the reaction: 1 in 25,000.

Picric acid (1 part in 100 parts water) gives a yellow amorphous precipitate, soluble in alcohol, more difficultly in hydrochloric acid, and easily, with a reddish yellow colour, in solution of caustic potash. Limit of reaction: 1 in 17,000.

Mercuric chloride (5 parts in 100 parts water) gives a white flocculent precipitate that rapidly settles, easily soluble in hydrochloric acid, more difficultly in acetic acid. From dilute solutions small crystalline needles are formed. Limit of reaction: 1 in 5,000.

Iodide of potassium and mercury (5 parts of potassium iodide and 1·4 part of mercuric chloride in 100 parts of water) gives a yellowish white amorphous precipitate, which upon the addition of hydrochloric acid is converted into delicate amber-yellow crystalline needles (characteristic reaction). Limit of the reaction: 1 in 3,500.

Concerning the definition of the limits of the last five reactions, the

most delicate for chinoline, it should be remarked generally, that not only the quantity of the body upon which it is to reach, but also that of the reagent, should be known. In every case 5 c.c. of the particular reagent was added to 45 c.c. of water, and the dilute solution of chinoline salt, containing a known quantity, allowed to run in drop by drop; with the exception of phosphomolybdic acid, where 5 c.c. each of phosphomolybdic and pure concentrated nitric acid were added to 40 c.c. of water.

The important influence the proportion of the liquid to be tested to the reagent has upon the limit of the reaction is shown by the following example :—In a mixture of 60 c.c. of water and 15 c.c. of 1 per cent. picric acid, 1 milligram of chinoline hydrochlorate produces a permanent precipitate, which would give the limit of the reaction as 1 in 75,000; whilst in a mixture of 70 c.c. of water, and 5 c.c. of the same picric acid,—consequently in the same quantity of liquid,—a distinct precipitate first results with 7 milligrams of chinoline hydrochlorate, which would give the limit at about 1 in 11,000.

Potassium ferrocyanide colours solution of a chinoline salt reddish. Upon the addition of a mineral acid, but not acetic acid, a reddish yellow amorphous precipitate is thrown down, which afterwards becomes crystalline. Limit of the reaction about 1 in 1,000.

Solution of potassium ferricyanide in hydrochloric acid produces in concentrated solution of chinoline beautiful small crystals.

Potassium bichromate, carefully added, forms delicate dendritic crystals, soluble in excess of the reagent.

Chinoline is not precipitated by tannic acid or ferric chloride. No colour reaction is produced, with dry salt of the alkaloid, either with concentrated nitric or sulphuric acid (the latter alone, or together with oxidizing materials).

Chinoline is not found in the urine after administration, and the author thinks that before it arrives there it is probably oxidized to a pyridine carbonate. Chinoline is readily oxidized by treatment with potassium permanganate to pyridine dicarbonate; it is possible that a similar change takes place in the body, and this would be more probable at a fever temperature than in a healthy body.

Note on Commercial Chinoline. C. Ekin. (*Pharm Journ.*, 3rd series, xii., 661.) The author shows that different commercial specimens of chinoline vary considerably in their composition and properties, and arrives at the conclusion that the German chinoline is probably a mixture of several homologous bodies. Finding that in some instances the so-called pure chinoline of commerce proves

to be merely a mixture of aniline and nitrobenzol, he calls special attention to the risk connected with the application of such preparations in the antiseptic treatment of dental caries, for which it has been much recommended.

Chinoline Tartrate and Salicylate. G. Friese. (*Ber. der deutsch. chem. Ges.*, xiv., 2805.) Chinoline salicylate is a reddish-grey crystalline powder, corresponding to the formula

$$C_9 H_7 N . C_7 H_6 O_3 .$$

The tartrate prepared sythetically by Hofmann and Schötensack answers to the formula $2\, C_9 H_7 N . 4\, C_4 H_6 O_6$. When decomposed by heat it splits up into chinoline and an organic acid.

Synthesis of the Chinoline Series. Z. H. Skraup. (*Wien. Akad. Ber.* [2], lxxxiii., 434–465, and *Journ. Chem. Soc.*, 1881, 919.) This is a continuation of the author's previous researches (see *Year-Book of Pharmacy*, 1881, 46). Following out the suggestion of Graebe, that alizarin-blue bears to nitro-alizarin the same relation that chinoline does to benzene, he has effected a synthesis of chinoline analogous to that of alizarin-blue. Thus, as nitro-alizarin and glycerol give alizarin-blue,

$$C_{14} H_7 (N O_2)\, O_4 + C_3 H_8 O_3 = C_{17} H_9 N O_4 + 3\, H_2 O + O_2,$$

so nitro-benzene and glycerol give chinoline:

$$C_6 H_5 N O_2 + C_3 H_8 O_3 = C_9 H_7 N + 3\, H_2 O + O_2.$$

But as the liberated oxygen exercises a violent reaction on the products of the change, it is found more practical to use.a mixture of nitro-benzene and aniline.

Chinoline.—On treating a mixture of nitro-benzene, aniline, and glycerol, in accordance with the equation

$$2\, C_6 H_7 N + C_6 H_5 . N O_2 + 3\, C_3 H_8 O_3 = 3\, C_9 H_7 N + 11\, H_2 O,$$

with strong sulphuric acid, a violent reaction occurs at first, which may subsequently be assisted by a gentle heat. The chinoline may be separated from the crude products of the reaction either by saturating with soda and separating the liberated base by distillation in a current of steam, or by treating the residue with ether and then fractionally precipitating with soda.

The author finds that the chinoline synthetically prepared is identical in every respect with the chinoline obtained from cinchonic acid. Chinoline, when oxidized by potassium permanganate, is converted into the *chinolinic acid* of Hoogewerff and Van Dorp. The

normal *potassium* salt of this acid forms white needles readily soluble in water, the *potassium hydrogen* salt large rhombic tables, which are completely decomposed at 230° into carbonic and nicotinic acids.

The author has further studied the similar reaction of the isomeric amido- and nitro-toluenes on glycerol, and has thereby obtained bases isomeric with lepidine, which must be considered to be derived from chinoline by replacement of the hydrogen-atom in the benzene nucleus. The name tolu-chinoline is proposed for this class of bodies, analogous to Graebe's anthrachinoline and naphthochinoline. The reaction whereby these tolu-chinolines are produced is as follows: $2 C_7 H_9 N + C_7 H_7 N O_2 + 3 C_3 H_8 O_3 = 3 C_{10} H_9 N + 11 H_2 O$. A detailed description is given of *orthotoluchinoline*, *paratoluchinoline*, and *naphthochinoline*.

The author considers that his researches offer material support to Körner's hypothesis of the constitution of chinoline. It would appear from the researches of König, that in the first phases of the synthesis of chinoline by the process described above, aniline acroleïn is formed, which is subsequently oxidized by the oxygen of the nitro-benzene. This view is supported by the observation that the reaction commences at 150–160°, a temperature at which the glycerol sulphate might decompose with formation of acroleïn; and further, that the distinctive smell of acroleïn is noticeable when nitrobenzene and glycerol are heated with sulphuric acid.

Studies on the Chinoline Series. J. Dewar. (*Journ. Chem. Soc.*, 1881, 1043.) The author has already shown that the leucoline bases occurring in coal-tar are aromatic derivatives, inasmuch as when oxidized by potassium permanganate, they are converted into leucolinic acid, $C_9 H_9 N O_3$, which, when decomposed by distillation with an alkali yields aniline; and this conclusion has been confirmed by the synthesis of chinoline from hydrocarbostyril, and from allylaniline. By further oxidation with permanganate, the same bases are converted into pyridine-dicarboxylic acid, $C_5 H_3 N (C O O H)_2$.

In the present paper, it is shown that chinoline ($C_9 H_7 N$) obtained from cinchonine is converted by oxidation with permanganate in acid solution into chinolinic acid, an acid isomeric with leucolinic acid, but melting at 143°, *i.e.*, 20° lower than the latter. It crystallizes in nodular masses very soluble in water. Its silver salt is very sparingly soluble, and separates from cold solutions as a flocculent precipitate, which becomes crystalline on standing. By recrystallization from a large volume of boiling water, this salt is obtained in tufts of slender needles, always, however, mixed with a

brown substance, apparently silver oxide. The acid gives no colour with ferric chloride, but the ammonia salt gives a violet precipitate, quickly changing to reddish brown.

The acid fused with potassium hydroxide gives aniline, and the silver salt when heated yields a crystalline sublimate, together with drops of aniline. The acid dissolves in hot glycerol, with fine violet fluorescence, and begins to decompose, giving off carbonic anhydride at 180°, together with drops of aniline. *Leucolinic acid* does not decompose in glycerol below 205°: its general decompositions are identical with those of chinolinic acid, and prove conclusively that both these acids belong to the aromatic group.

Tar Leucoline.—According to Greville Williams, the leucoline of tar is distinguished from the corresponding cinchona-base by forming an oily uncrystallizable chromate. The author, on the other hand, finds that the leucoline used in his own experiments was a mixture of two isomeric bases, one of which yielded a crystallized chromate, not, however, identical with the chromate of the alkaloid base. The largest yield of crystalline chromate was obtained from the portion of the base which boiled between 210° and 220°. In no case did the mixture of the base with excess of chromic acid yield crystals until it had stood for several days. After separating the crystals, the free base was obtained by distillation with potassium hydroxide, and immediately gave a well crystallized salt on addition of a little chromic acid. The existence of at least two distinct leucolines in tar is also shown by the reaction of crude leucoline with chloride and iodide of ethyl, whereby two ethylated bases are formed, distinguished from one another by their behaviour to chromic acid.

Oxidation of Leucoline.—The largest amount of leucolinic acid is obtained when 1 part of the base dissolved in the form of sulphate is treated with $2\frac{1}{2}$ parts of potassium permanganate dissolved in boiling water. The crude acid separated from the potassium or lead salt always contains a considerable quantity of a syrupy acid, perhaps derived from one of the isomeric bases, which does not crystallize unless it is boiled with water for some days.

Crystalline leucolinic acid treated with glycerol gives a small quantity of substance exhibiting the reactions characteristic of indole. If fused lead chloride be used instead of glycerol, the distillate consists of aniline hydrochloride without any of the indole substance. Similarly, a solution of the potassium salt of the acid heated to 200° gave only aniline, carbonic acid, and acetic acid. On heating the acid with zinc dust, chinoline was not reproduced, the product consisting of a crystalline substance not yet examined.

Leucolinic and chinolinic acids appear from their decompositions to consist of *amidophenylpyruvic acids*, and their general relations to nearly allied substances are shown in the following formulæ :—

Cinnamic Acid . . .	$C_6H_5.CH:CH.COOH.$
Amidocinnamic Acid . .	$C_6H_4(NH_2).CH:CH.COOH.$
Carbostyril	$C_6H_4NH.CH:CH.CO.$
Chinoline . . .	$C_6H_4.N:CH.CH:CH.$
Lucolinic and Chinolinic Acids	$C_6H_4(NH_2).CH_2.CO.COOH.$

An acid represented by the last formula should be readily hydrogenized, producing an *amidophenyl-lactic acid*,

$$C_6H_4(NH_2).CH_2.CHOH.COOH,$$

isomeric with and closely related to tyrosine,

$$C_6H_4(OH).CH_2.CH(NH_2).COOH,$$

and differing from the latter only in having the amido-group attached to the phenylic instead of to the pyruvic residue: such isomeric tyrosines are produced by treating leucolinic and chinolinic acids with sodium-amalgam. Both products react with the mixed mercurous and mercuric nitrates, giving a red colour somewhat resembling the well-known tyrosine reaction, the difference between them and ordinary tyrosine being that, when fused with an alkali, they both yield aniline, whereas ordinary tyrosine similarly treated yields ammonia and parahydroxybenzoic acid.

Dichinoline. H. Weidel. (*Monatsh. f. Chem.*, ii., 491–506, and *Journ. Chem. Soc.*, 1882, 69.) When 100 grams of chinoline are heated with 15 of sodium at 192° for two or three hours, the liquid changes in colour from yellowish brown to dark violet-brown, and at the same time becomes viscid, and finally sets to a hard resinous mass. This product is dissolved in benzene; the solution poured off from the unattacked sodium and shaken up with water as long as the latter is coloured brown; the benzene is driven off on a water-bath, and the residue distilled. The fraction passing over above 360° solidifies to a crystalline mass impregnated with an oily substance; the oil is removed from the crystals by suction and washing with alcohol. The crystals are dissolved in moderately strong hydrochloric acid, and the hydrochloride recrystallized several times from dilute hydrochloric acid; ammonia sets free the base, which can be obtained pure by crystallizing from alcohol. The author calls this *a-dichinoline*, $C_{18}H_{12}N_2$; it crystallizes in colourless

monosymmetrical leaflets, having a mother-of-pearl-like lustre, moderately soluble in warm ether, benzene, chloroform, etc., easily in hot, scarcely in cold alcohol, insoluble in water; they melt at 175·5°, and sublime (the sublimed substance melts at 176–177°). The boiling point is above 400°, when slight decomposition sets in. The alcoholic solution reacts neutral, and has a biting taste.

The author gives a detailed description of several salts of this base, viz., the *sulphate*, $C_{18}H_{12}N_2 . H_2SO_4 + H_2O$; the *hydrochloride*, $C_{18}H_{12}N_2, 2HCl + 4H_2O$; the *platinochloride*, $C_{18}H_{12}N_2, 2HCl\,PtCl_4 + H_2O$; and the *aurochloride*, $C_{18}H_{12}N_2, HCl . AuCl_3 + 2H_2O$.

Chinoline from cinchonic acid also yields α-dichinoline when treated with sodium. The author shows that the other product of the distillation of the cinchonic acid with lime, is also a dichinoline, and proposes to call it β-dichinoline. After purification by repeated crystallization of its hydrochloride, and decomposition of the same with ammonia, it crystallized from alcohol in small, perfectly colourless, broad, monoclinic needles, melting at 192·5°. He thinks it highly probable that this body is identical with Japp and Graham's dichinolyline, from the action of benzoic chloride on chinoline.

Contribution to the Examination of Pilocarpine and its Salts. A. Christensen. (Abstract of a paper published in the *Pharm. Zeitschr. für Russland*, xx., No. 36. From *Pharm. Journ.*) Some time ago several specimens of pilocarpine and its salts were sent to the Dorpat Pharmaceutical Institute, with the request that they might be submitted to a comparative examination, complaints having been made as to the activity of one of them. At the request of Professor Dragendorff, the author undertook the examination of the specimens, which consisted of two samples of pure pilocarpine (marked T and M), three of hydrochloride (two marked T and one M), and two of nitrate (T and W). The last salt (W) was known to have been made from true jaborandi leaves.

The samples were first submitted to qualitative tests with various reagents, but without any difference being observable; all the preparations give similar reactions.

This being the case, it was found necessary to proceed to the determination of the quantitative composition of the samples, and the first estimations made were those of the water and acid radical. These amounted to, in the hydrochlorides, 14·10 to 14·50 per cent. of chlorine, and 2·97 to 3·78 per cent. of water; in the nitrates to 20·9 and 23·4 per cent. of nitric acid, and 1·00 and 1·29 per cent. of water. These results must be regarded as tolerably concordant for the different preparations.

The next determination was that of the alkaloid itself, and as the only method for the quantitative estimation of pilocarpine that had as yet been suggested was that of Poehl's, it was natural that the precipitation he recommends, viz., with phosphomolybdic acid, should be tried. The results were, however, highly unsatisfactory. In four cases out of the five 106·7 to 135·6 per cent. of the quantity taken was found, but in the fifth no less than 429·8 per cent. The conclusion drawn from these estimations was that the composition of the phosphomolybdic acid precipitate is not constant, and consequently the calculation of the alkaloid incorrect. Like Poehl, the author found titration with Mayer's solution (potassio-mercuric-iodide) not applicable for the estimation of pilocarpine.

The next trial was made by rendering the solution of the alkaloid alkaline with soda and shaking with chloroform. This yielded far less alkaloid than might be anticipated to be present. A second experiment, using $\frac{1}{10}$ normal solution of soda, and titrating with $\frac{1}{10}$ normal nitric acid, so as to estimate together nitric radical and alkaloid, gave 37·8 per cent. of alkaloid and 35·4 per cent. nitric radical, which does not at all agree with the previous estimation of the nitric acid, nor with the anticipated amount of alkaloid. The latter should have amounted (theoretically) to 78·4 per cent. It seemed probable, therefore, that some of the alkaloid had been converted into an acid by the action of the alkali. An excess of carbonate of soda solution was added to a solution of pilocarpine salt, and the whole evaporated to dryness. The residue yielded to chloroform only 6·2 per cent. of the amount of alkaloid taken, thus confirming the suspicion that the alkaline converts part of the alkaloid into an acid. With regard to the removal of pilocarpine from its solution by shaking with various liquids, the author differs from Poehl in finding that this is effected by benzin as well as by chloroform.

Finding that chloride of gold formed with pilocarpine a very slightly soluble double salt (solubility 1 in 4600), the estimation of alkaloid was effected by precipitating the solution with chloride of gold, weighing the precipitate, and calculating the alkaloid according to the formula $C_{23}\,H_{34}\,N_4\,O_4\,(H\,Cl,\,Au\,Cl_3)_2$.

By this method the chlorides yielded 81·4, 83·0, and 84·2 per cent. of pilocarpine; the nitrates 75·28 and 78·09; the hydrates 78·35 and 86·50. The composition of the three salts was then as follows:—

	Hydrochlorides.			Nitrates.		Hydrates.	
	T_1	T_2	M	T	W	T	M
Acid Radical . . .	14·50	14·36	14·10	23·43	20·9	—	—
Water	3·78	2·97	3·12	1·29	1·01	21·65	13·50
Alkaloid	81·40	83·0	84·2	75·28	78·09	78·35	86·5
	99·68	100·33	101·42	100·00	100·00	100·00	100·00

In this table no great difference is to be observed in the composition of the several salts. All who are acquainted with the difficulty experienced in making such determinations would be inclined to refer the differences to unavoidable error in the estimation, and regard the preparations as equally good. The physiological experiments made by Dr. Podwyssozki led, however, to different results.

According to these experiments, which were made on frogs, the salts marked T had all the same action (one of the chief symptons of which was paralysis, especially of the hind legs, followed by the death of the animal), were more active than pilocarpine generally is, and resembled jaborine and atropine. The salts marked M and W produced less violent effects (a double dose caused tetanic extension of the hind legs for about ten minutes, but was not followed by death), and resembled more closely pilocarpine or nicotine. This difference in effect cannot be referred to the employment of different leaves in the manufacture of alkaloid, since extracts of true and false jaborandi produced similar effects. It could be explained by assuming that the salts T_1, T_2, as well as the leaves, contained jaborine, but the presence of the alkaloid could not be recognised with certainty. At all events, it is not impossible that the different methods adopted in various laboratories for the manufacture of pilocarpine yield either two, or mixtures of two, different alkaloids. Judging from the chemical experiments, those two alkaloids seem to be closely allied, not isomeric, but perhaps homologous. The preparations marked T show a smaller equivalent than those marked M and W. Further experiments, however, are required to settle this point.

The Formula of Pilocarpine. P. Chastaing. (*Journ. de Pharm et de Chim.* [5], iv., 336.) Pilocarpine may be completely freed from jaborine by treating the nitrate with absolute alcohol. The author's analysis of the perfectly pure nitrate and of the platinochloride

confirm Harnack and Meyer's statement that the composition of the pure base is represented by the formula $C_{11} H_{16} N_2 O_2$.

Pilocarpine. P. Chastaing. (*Comptes Rendus*, xciv., 223.) By treating pilocarpine with fused potash, the author obtained methylamine, carbonic anhydride, butyric acid, and traces of acetic acid. No formation of conicine could be observed.

Action of Fuming Nitric Acid and of Hydrochloric Acid on Pilocarpine. P. Chastaing. (*Comptes Rendus*, xciv., 968.) The author states that pilocarpine, when treated with about 300 parts of fuming nitric acid, yields nitrate of jaborandine, $C_{10} H_{12} N_2 O_3 . H N O_3$, together with traces of another base, probably jaborine. He also reports having obtained a small quantity of jaborandine hydrochlorate by evaporating a solution of pilocarpine in a very large proportion of hydrochloric acid.

Action of Nitric Acid on Atropine. L. Pesci. (*Gazz. Chim. Ital.*, 1881, 538.) The action of nitric acid on atropine results in the formation of a new alkaloid, *apoatropine*, which differs in its composition from atropine by minus the element of one molecule of water. It crystallizes in colourless prisms, which fuse at 60–62° C., are slightly soluble in water, more so in benzol and amyl-alcohol, and freely in alcohol, chloroform, and bisulphide of carbon. It is without action on the pupil of the eye. It reduces the action of the heart, and when taken in larger doses produces characteristic convulsions.

Preparation of Cocaine. V. Truphème. (*Chem. Centr.*, 1881, 447.) This base may be readily prepared by extracting cut coca leaves with ether, evaporating the ethereal solution, dissolving the residue in boiling water, treating the filtered solution with magnesia, again exaporating, and extracting the alkaloid from the residue by means of amyl-alcohol. It is thus obtained in pale yellow crystals, which become colourless upon recrystallization.

Preparation and Properties of Pure Emetine. Dr. V. Podwyssotzki. (*Pharm. Zeitschr. für Russland*, and *Schweiz. Wochenschr. für Pharm.*) Powdered ipecac. is extracted first with officinal ether, then with petroleum ether, until a drop or two, on evaporation, does not leave any spots. There is a species of ipecac. which yields an intensely straw-coloured ethereal extract, and which contains an acid crystallizing from chloroform in needles. According to the author, this very species of ipecac. appears to contain most emetine. The ether having removed oil and a waxy body, the residuary powder is dried and extracted with alcohol of 86°, without acid. This menstruum extracts colouring matter and a considerble quantity of

tannin, turning ferric salts green. The alcohol having been removed, the syrupy residue is mixed with ferric chloride (about 10 to 13 per cent. of the original weight of the ipecac.), dissolved in a little water until a sample of the extract brought in contact with solid ferric chloride no longer colours the latter green. Powdered sodium carbonate is now added to strong alkaline reaction, and the mass treated with petroleum ether on the water-bath; by blowing through a tube a fine current of air through the liquid, the emetine is deposited as a white powder. The extraction by means of hot petroleum ether is repeated until only traces of emetine are taken up. Concentrated solutions of emetine deposit it in twelve hours, on standing in a cool place. Dilute solutions do not deposit it, and it is best separated in this case by blowing air through them for some time, when it will fall down as a white powder. It must be rapidly collected on a filter and dried over sulphuric acid in vacuo. 400 grams of the best kinds of ipecac. yielded 3 to 4 grams of *pure* emetine ($\frac{3}{4}$ to 1 per cent.). It is readily soluble in ether, also easily in chloroform, acetic ether, methylic, and amylic alcohol, carbon bisulphide, alcohol of every strength, oil of turpentine, ethereal oils, and also considerably soluble in fixed oils and fats. It is difficultly soluble in cold petroleum ether or benzin, but easily when hot. It requires 1000 parts of water for solution. By exposure to sunlight it acquires a yellow colour, particularly if at the same time exposed to air. Its melting point is between 62° and 65° C. The salts are easily soluble in water, alcohol, fixed oils; and insoluble in ether, petroleum ether, and benzin.

Lupinine. N. Betelli. (*Gazz. Chim. Ital.*, xi., 237, 240; *Amer. Journ. Pharm.*, 1882, 251.) *Lupinine* is an alkaloid, recognised by Campani in the seeds of *Lupinus albus.* The author prepares it from the decoction of the seeds, by treating it with lime, concentrating the filtrate, and exhausting this with ether. The alkaloid is precipitated by tannin and the chlorides of platinum and mercury; it reduces gold solution and silver nitrate, crystallizes from benzol in needles, is dissolved from the alkaline aqueous solution by agitation with ether, benzol, and chloroform, has a very bitter taste, and is poisonous to frogs, but apparently not deleterious to man, even if given in rather large doses.

Homologue of Pelletierine. A. Étard. (*Comptes Rendus*, xcii., 460. From *Journ. Chem. Soc.*) By slow distillation of a mixture of 50 grams ammonium chloride with 300 grams glycerol, 40 grams of a yellowish oil were obtained, boiling, after purification, at 155°. The analysis of this body leads to the formula C_6H_9NO

(hydroxypicoline), and its formation is represented by the equation,

$$2\,C_3H_8O_3 + NH_4Cl = HCl + 5\,H_2O + C_6H_9NO.$$

Hydroxypicoline is a colourless, refractive liquid (b. p. 155°), of strong odour and acrid taste, soluble in all proportions in water, alcohol, and ether. Its sp. gr. is 1·008 at 13°. Hydroxypicoline is a strong base, and reduces gold and silver salts. It forms precipitates with certain metals, with tannin, iodine, and bromine-water, mercuric chloride, auric chloride, and picric acid; the compounds with the last four are soluble in water and crystallizable.

The platinochloride, $C_6H_9NOClH, PtCl_4$, crystallizes from a concentrated solution in yellow needles. The mother-liquors from this salt are reduced when boiled, and give a greenish yellow insoluble compound of the formula $(C_6H_7N)_2PtCl_4$.

The aurochloride, $C_6H_9NO.AuCl_3$, is crystallizable, and melts at 154.°

When oxidized by dilute nitric acid, hydroxypicoline gives a small quantity of pyridine, together with carbonic anhydride and hydrocyanic acid. When fused with potassium hydroxide, it is slowly decomposed, with evolution of hydrogen. The constitutional formula of hydroxypicoline is probably $C_5H_4N.C_2H_2OH.H_2$. Its properties and composition show that it is homologous with the base *pelletierine*, extracted by Tanret from pomegranate-bark, and with the base $C_8H_{13}NO$, which Wurtz obtained by the distillation of ammonia-aldol.

Conversion of Xanthine into Theobromine and Caffeine. E. Fischer. (*Ber. der deutsch. chem. Ges.*, xv., 453.) Xanthine, $C_5H_4N_4O_2$, differs in composition from theobromine, $C_7H_8N_4O_2$, by containing 2 atoms of carbon and 4 of hydrogen less, a relation which induced Strecker to regard the latter base as probably a dimethyl-derivative of the former. This view is now fully confirmed by the author, who has actually succeeded in effecting the conversion of xanthine into theobromine, and of the latter into caffeine. He first converts the xanthine into a lead compound by precipitating its solution in soda by means of lead acetate. The precipitate, after being dried at 130° C., was heated for twelve hours in a closed tube with one and a quarter times its weight of methyl iodide to 100° C., the contents of the tube are then boiled with water, the solution freed from lead by sulphuretted hydrogen, and the filtrate supersaturated with ammonia and evaporated to the point of crystallization. The faint yellow crystals thus obtained proved

to possess the composition and all the properties of theobromine. This was then converted by Strecker's method into caffeine.

While theobromine, therefore, may be regarded as dimethylxanthine, caffeine appears to be the trimethyl-derivative of the same base.

Lycopodine. K. Bödeker. (*Liebig's Annalen*, ccviii., 363.) The author has isolated from *Lycopodium complanatum* a crystalline alkaloid which he proposes to name lycopodine. The composition of the base is represented by the formula $C_{32}H_{52}N_2O_3$. It fuses at 114° C., has a very bitter taste, and is readily soluble in water, alcohol, ether, chloroform, benzol, and amyl-alcohol. It is obtained by the following process:—

The dried plant is twice treated with boiling alcohol; and the residue which remains when the alcoholic solution is evaporated is repeatedly extracted with warm water. Subacetate of lead is added to the aqueous solution, the precipitate removed by filtration, and the lead in the filtrate is precipitated by sulphuretted hydrogen. The liquid, after evaporation, is mixed with an excess of alkali and shaken with ether. The ethereal extract is evaporated, and the residue which remains is dissolved in dilute hydrochloric acid. After repeated recrystallization from water, the hydrochloride is obtained in peculiar monoclinic crystals, which have the composition $C_{32}H_{52}N_2O_3, 2HCl + H_2O$. From these the alkaloid is obtained by mixing their concentrated solution with an excess of sodium hydrate, and then placing a stick of solid potash into the liquid. A colourless resin-like substance is thus gradually precipitated, which slowly changes into monoclinic crystals.

Compounds of Organic Bases with Bismuth Iodide. K. Kraut. (*Liebig's Annalen*, ccx., 310.) The author points out that the precipitates found by vegetable alkaloids with solution of the double iodide of bismuth and potassium are very inconstant in composition. They are decomposed by water, and in many cases also by absolute alcohol; and their composition varies with their mode of preparation, according to the variations in the relative proportion of the precipitant used. The reagent is therefore of not much value for analytical purposes.

The Ptomaines, and their Importance in Forensic and Toxicological Investigations. Dr. T. Husemann. (*Archiv der Pharm.*, xix., 415.) An elaborate report, unsuited for abstraction. Of special interest are the author's observations on arsenical ptomaines, as the existence of volatile combinations of this kind may account for the poisonous effects of the air in rooms papered with arsenical wall papers.

The Preparation and Composition of Colchicin, and its Relation to Colchicein and some other Decomposition Products. J. Hertel. (*Pharm. Zeitschr. für Russland*, 1881, 245.) For the preparation of colchicin, the author recommends the following process:—

Whole colchicum seed is packed in a displacement apparatus and treated with successive portions of 85 per cent. alcohol, until the percolate has only a pale-yellow colour. Four portions of alcohol, each sufficient to cover the seed, are enough. Finally, to extract the last traces of colchicin, a quantity of boiling alcohol is poured over the seed. The united, faintly acid liquids are mixed with calcined magnesia, the whole is well shaken, filtered after a few hours, and the filtrate distilled in a vacuum until a liquid extract remains. If the distillation is carried on at the ordinary pressure, a good deal of colchicin is lost in consequence of the longer exposure to heat.

The contents of the retort are mixed with ten volumes of water, and the oily matter separating on the top removed (which is best done in a burette or similar vessel). The liquid is then filtered, and repeatedly shaken with chloroform until the latter remains almost colourless. It is easy to recognise by the taste whether any colchicin has remained in the liquid. When it is all removed, and the little chloroform remaining in the liquid has been driven out by heat, the liquid has a sweet taste.

The chloroform solutions are distilled until a syrupy residue remains, which is poured out on glass or porcelain plates, and warmed for an hour at a temperature of 80–100° C., to completely dissipate the chloroform. The chloroform is retained by the colchicin with great obstinacy, and it is, therefore, absolutely necessary to spread it out in as thin layers as possible. When all the chloroform has evaporated, the residue ceases to be soft and waxy at a 100° C.

This crude colchicin, which appears as an amorphous, brown, brittle mass, is purified by redissolving in twenty parts of water, whereby the colouring matter is left behind. The solution is filtered, and the filtrate (instead of being again shaken out with chloroform, according to Eberback), at once evaporated in a flat capsule.

The yield of product, by following this process, was 0·38 to 0·41 per cent. of the weight of the seed. The difference in yield which may be obtained from one and the same material is caused by the tendency of colchicin to decompose; for this reason, it is advisible never to let colchicin stand for any length of time in its solutions, and to complete the different steps as rapidly as possible.

A good yield can be obtained only by using *whole* seed. From powdered seed much less (about one-half of the former yield) is obtained, as the solution is loaded with so much foreign matter.

On heating colchicin, $C_{17} H_{23} N O_6$, with a mineral acid, it loses a molecule of water, and is converted into *colchicein*, and the latter by warming with water is reconverted into colchicin. In the air it loses ammonia and water, being first converted into colchicaresin, $C_{51} H_{60} N_2 O_{15}$, and finally into betacolchicoresin, $C_{34} H_{39} N O_{10}$. These latter products are found in samples of *Vinum colchici* which have been kept for some time, and are not inferior in their physiological action to colchicin.

Bergenin. MM. Garreau and Machelart. (*Répert. de Pharm.*, 1881, 319; *Pharm. Journ.*, 3rd series, xii., 83.) Bergenin is a crystalline bitter principle, isolated a short time ago from plants of the Saxifrage family. Some further details respecting this substance are now given by the authors, from which it appears to possess faintly acid properties, and to combine with potash, lime, baryta and magnesia, to form soluble salts. Analysis gave results represented by the formula, $C_3 H_4 O_2$. It requires for solution at 15° C. 167 parts of 90° alcohol, or 830 parts of water; but it is more soluble in these liquids when boiling, and crystallizes from them upon cooling. Bergenin is alleged to constitute an important therapeutic agent, and to be a powerful tonic, ranking in its action between salicin and quinine. It has been found to be present in the dried rootstocks of *Saxifraga siberica* to the extent of 2·5 per cent. These rootstocks are said to contain also one-fifth of their weight of quercitannic acid, and double that proportion of feculent matter; on this account, therefore, it is suggested that *Saxifraga siberica* or *S. cordifolia* might be made to repay cultivation.

Vicin and Convicin. H. Ritthausen. (*Journ. pract. Chem.* [2], xxiv., 202–220. From *Journ. Chem. Soc.*) The author has already described the method of preparation and the properties of vicin, the nitrogenous substance found in *Vicia sativa*. In the present communication, he gives an account of later methods employed. 80 kilos. of the powdered seeds are treated with hydrochloric acid, to which, after three to four hours, milk of lime is added in excess. After standing for some time, the supernatant clear liquid is decanted, and mixed with milk of lime and mercuric chloride, until no further precipitate is formed. This precipitate, after washing, addition of baryta-water, and heating, is decomposed by sulphuretted hydrogen, filtered hot, and the baryta is precipitated by carbonic anhydride. Further evaporation

causes the separation of albumen, etc., and finally from the liquid, greatly reduced in bulk, vicin crystallizes out, leaving convicin in solution, which separates in brilliant plates when the liquid is more concentrated. Purification of the vicin is effected by means of 80 per cent. alcohol and charcoal. The yield is only 0·355 per cent. The analyses of the vicin obtained in previous years pointed to the formula $C_8 H_{16} N_3 O_6$, but those of the more carefully purified substance require $C_{28} H_{51} N_{11} O_{21}$ as the formula. One part of the vicin is soluble in 108 of water, and at 120° it loses 2 aq., decomposing at 180°. Lime and baryta-water, as also dilute potash, dissolve vicin without decomposition; the same is the result when hydrochloric and sulphuric acids are employed; but if the temperature is raised to boiling, and the concentration of the acids increased, a yellow solution is formed, which, when cold, is changed to a deep blue on the addition of a small quantity of ferric chloride and ammonia. If baryta-water is used, then a violet-blue precipitate is produced, which loses its colour when boiled, and reduces silver nitrate. The following salts have been prepared:—

$$3\,(C_{28} H_{51} N_{11} O_{21}),\ 4\,H_2 S O_4 \text{ and } 4\,(C_{28} H_{51} N_{11} O_{21}),\ 11\,H\,Cl;$$

the nitrate could not be obtained, as nitric acid decomposes the base, which however combines with metallic oxides, such as mercuric oxide. Vicin boiled with potash yields ammonia, and gives the same reaction with ferric chloride and ammonia above referred to. If, however, the potash is strong, then decomposition goes too far, and this reaction does not occur. In no case does hydrocyanic acid appear, so long as the potash is in solution; but on fusion, the evolution of ammonia is greater, and on treating the product with sulphuric acid, hydrocyanic acid is evolved; a crystalline substance soluble in ether is formed at the same time. This formation of the hydrocyanic acid should lead to a definite knowledge of the constitution of vicin, but the author is unable to continue the investigation. This same reaction is mentioned in the former paper, and was then ascribed to amygdalin.

Decomposition by Acids.—When vicin is heated with dilute sulphuric acid (1 : 5), a white crystalline substance separates out, and a gas is evolved; these crystals also show the iron and ammonia reaction. This substance, which is combined with sulphuric acid, has been named *divicin*, $2\,(C_{11} H_{19} N_{10} O_6)\,5\,S\,O_3$, and the pure divicin has also been separated in prismatic crystals, which reduce silver nitrate, and have the composition $C_{31} H_{50} N_{30} O_{16}$. The gas which is evolved is believed to be octyl-hydride. Aqueous

solutions of divicin decompose on evaporation. Nitric acid transforms divicin into a substance sparingly soluble in water, which appears to be a nitrate, $C_{31} H_{50} N_{30} O_{16} . 8 H N O_3$. Fused potash causes the formation of ammonia and potassium cyanide; so that here, as in vicin, nitrogen exists in the two forms of $C N$ and $N H_3$, or $N H_2$. The action of sulphuric acid on vicin is therefore principally to produce divicin, but other substances are also formed.

Convicin.—This substance, already referred to, is separated from vicin by treating the mixture with dilute sulphuric acid, which dissolves the latter readily, but not the former. Convicin crystallizes in thin rhombic colourless plates, often aggregated together, resembling leucin. Strong potash-solution does not produce ammonia from convicin; neither have dilute acids any decomposing action. The aqueous solution is precipitated by mercuric nitrate, and the other metallic salts also produce precipitates, but only when the solution is neutral. Convicin, $C_{10} H_{14} N_3 O_7 . H_2 O$, melts without decomposition.

Curcumin. C. L. Jackson and A. E. Menke. (*Pharm. Journ.*, 3rd series, xii., 625.) The authors describe the results of their investigation of curcumin, showing it to be a diatomic monobasic acid. Treated with weak oxidizing agents it yields vanillin, but in too small quantity for purification. By oxidizing diethyl-curcumin with potassium permanganate, ethyl-vanillic acid with a melting-point of 195° was obtained.

The Tannin of Oak Bark. J. Löwe. (*Zeitschr. für Analyt. Chem.*, xx., 208–223.) Oak-bark tannin is not, as is usually believed, a glucoside, furnishing glucose and oak-bark red on treatment with acid; but is simply transformed by dehydration into the latter substance, with formation of very small amounts of intermediary products.

For the preparation of the oak-bark tannin in a pure state, the bark is extracted with 90 per cent. alcohol, the alcohol removed from the solution by distillation, and the residue treated with water, in which it partly dissolves, yielding a dark brown solution, and leaving a reddish brown insoluble substance. The solution, when saturated with sodium chloride, deposits tannic anhydride; whilst the solution, on treatment with ether (in which the oak-bark tannin is practically insoluble), yielded to the latter some gallic and ellagic acids. After the removal of the ether the solution is shaken with acetic ether, in which the tannin dissolves, and is obtained in the form of a reddish brown brittle mass. With ferric salts its solution

gives a blue-black, with tartar emetic, gelatin, albumen, or alkaloids, yellowish white precipitates.

Heated with dilute acids under pressure, the tannin readily yields oak-red.

The relation between the various products obtained is seen from the following formulæ :—

Two hydrates of tannic acid, $C_{28} H_{24} O_{12}, 3 H_2 O$,
$C_{28} H_{24} O_{12}, 2 H_2 O$.
The lead salt, $C_{28} H_{18} Pb_3 O_{12}, 5 H_2 O$
Tannic anhydride, $C_{28} H_{24} O_{12}$.
Its lead salt, $C_{28} H_{22} Pb O_{12}, 3 H_2 O$.
Oak-red, $C_{28} H_{22} O_{11}$.

Quebrachotannic Acid. P. N. Arata. (*Anales de la Soc. Cientif. Argentina*, Feb., 1879. From *Journ. Chem. Soc.*) This acid is obtained from the so-called "gum" of the *Quebracho colorado*, formerly called *Loxopterygium Lorentzii*, but now referred by Grisebach to a distinct genus, and called *Quebrachia Lorentzii.* It may be prepared from the wood or from the gum of the tree by various processes, best, however, by dissolving the gum, previously purified by treatment with alcohol, in boiling water, and filtering hot, the filtering liquid as it cools depositing a tannin in reddish tufts, which must be washed rapidly on a filter, pressed between bibulous paper, and dried over sulphuric acid. The mother-liquid still, however, retains a considerable quantity of the tannin, which may be separated by treating the solution with hydrochloric acid, sulphuric acid, or common salt; when washed and dried as above described, it constitutes nearly pure quebrachotannic acid. In whatever way the acid may be prepared, it is very apt to become coloured by contact with the air or with alkalies, and even by prolonged boiling of its solutions; moreover, the colour thus produced cannot be removed by means of animal charcoal, which, on the contrary, gives rise to the formation of products having a deeper colour and resinous aspect.

Quebrachotannic acid is a pale-red amorphous mass, having a stringent taste, and yielding a light cinnamon coloured powder. It is insoluble in carbon bisulphide, chloroform, turpentine oil, and benzene. Its aqueous solution is precipitated by various metallic salts; with lead acetate, normal or basic, a white precipitate is formed, which, when heated, acquires first a rose and then a chocolate colour; with ferric chloride a green liquid is produced, changing after a while to dark red, and becoming black on addition of

sodium acetate. With albumen (either of egg or of blood), and solution of the alkaloids, white precipitates are formed.

Quebrachotannic acid is decomposed by dry distillation, yielding catechol. Strong nitric acid converts it into oxalic and picric acids. By fusion with potassium hydroxide it is resolved into phloroglucol and protocatechuic acid; and the same products are formed by the action of sulphuric acid on its aqueous solution.

The above-described properties show that quebrachotannic acid belongs to the group of tannins which precipitate gelatin and colour ferric salts green, like catechutannic and kinotannic acids; but it does not agree exactly in composition with either of these acids, as the following comparison will show :—

	Carbon.	Hydrogen.
Catechutannic Acid	62·06	4·43
Kinotannic Acid	62·91	4·48
Quebrachotannic Acid	52·52	5·11

Neither does it agree exactly in composition or properties with any of the other tannins which give green precipitates with ferric salts; hence the author regards it as a distinct chemical species.

Quebrachocatechin. — This body, the existence of which in Quebracho gum was rendered probable by the author's former experiments, may be prepared by dissolving the gum (about 1 kilo.) in boiling water, precipitating the quebrachotannic acid with sulphuric acid; agitating the filtered liquid with twice its volume of ether; distilling off two-thirds of the ether, then evaporating to dryness, and treating the residue with dilute alcohol, which dissolves the crystals that have formed, leaving a resinous substance undissolved, and on treating the solution with a small quantity of basic lead acetate to precipitate the quebrachotannic acid dissolved by the ether, evaporating the filtrate on the water-bath, and leaving it at rest, a yellowish crystalline mass is obtained, the alcoholic solution of which leaves the catechin on evaporation in yellowish crystals.

Quebrachocatechin is insoluble in cold, and only slightly soluble in hot water; very soluble in alcohol or ether. Its solution is clouded by normal lead acetate; gives rose-coloured precipitates with basic lead acetate and with mercurous nitrate, blackish with a mixture of ferrous sulphate and sodium acetate; reduces silver nitrate and gold chloride; is coloured yellow by nitric acid, red by sulphuric acid, yellowish by sodium hypochlorite, green by Fehling's solution; does not precipitate gelatin or the alkaloids. The quantity

of quebrachocatechin obtained was not sufficient for analysis, but from its reactions and its analogy to other members of the catechin group, the author infers that it stands to quebrachotannic acid in the relation of acid to anhydride.

New Process for Extracting Tannin by Dialysis. O. Kohlrausch. (*Journ. Chem. Soc.* From *Dingl. poylt. Journ.*, ccxl., 72-75.) Some time ago it was proposed to prepare tannin extracts in Hungary from a variety of barks and woods, especially chestnut wood and oak. The author has thoroughly investigated this question, and succeeded in devising a process of extracting tannin in almost theoretical quantities from different kinds of bark. The mode of procedure, necessary apparatus, and plant are described in detail. With regard to the experimental part of the paper, the author concludes that as in tanning the tannin enters the skin by osmosis, it similarly leaves the cells of plants through their permeable membrane, chemical and microscopical examination having shown that the interior of the uninjured cells is the same as the exterior of thick bark which had already been utilised. It is therefore not the solution of the tannin set free by finely dividing the bark, and taken up by the skins, but dialysis of the tannin through the permeable membrane of the plant cells, and also through the animal membrane of the skin. Hence it is not requisite to divide the bark into very small particles, but pieces may be used with advantage which are small enough to allow the dialysing operation to take place in a battery of closed vessels, thus avoiding any danger of choking up the valves or pipes of the apparatus. The result is that purer extracts are obtained in a more economical manner, so that lighter-coloured leather is produced; and if the freshly-prepared extracts are used at once, the author believes that considerably less of the tannin in a fresh active state will be required for tanning. Experiments have shown that tannin passes through the animal membrane very rapidly in the dialyser; that in a short interval fine extracts run from a battery; and that the residual bark (of the size of peas) is almost entirely free from tannic acid.

The Catechins. C. Etti. (*Monatsh. Chem.*, ii., 547–557. From *Journ. Chem. Soc.*) The author has re-examined the catechins from Gambia and Pegu catechues, and finds that they are identical. He dried his substance over sulphuric acid, and, like Zwenger (*Annalen*, xxxvii., 320), who dried his at 100°, obtained numbers from analysis agreeing with $C_{18}H_{18}O_8$. Catechin loses water when dried at 110–115°, or at 100° in a stream of hydrogen, the numbers from analysis now agreeing with Liebermann's. It

melts at 140° without further loss of water, and the fused substance dissolves in boiling water; the solution deposits crystals of catechin. At 150–160° it loses more water, and is converted into an anhydride of the formula $C_{36}H_{34}O_{15}$, a brownish red amorphous powder, insoluble in water but soluble in alcohol, from which solution it is precipitated in crystals by lime water. At 170–180° this anhydride loses another molecule of H_2O, forming another anhydride, $C_{36}H_{32}O_{14}$, which in its turn by further loss of water, at 190–200° becomes $C_{36}H_{30}O_{13}$. On treating a concentrated solution of catechin in dilute alcohol with diazobenzene chloride, a red crystalline precipitate is formed, which, after recrystallization and drying at 90–100°, gave numbers for the formula $(C_6H_5 . N : N)_2 C_{18}H_{16}O_8$; this azo-body is stable in air, dissolves in alcohol, ether, and alkalies, and dyes silk brownish yellow. Heated to 140° with dilute sulphuric acid in sealed tubes, the catechin yields the red catechin anhydride, catechol, and phloroglucinol; when fused with potash for a short time, these last two bodies are the only products, but on continuing the fusion dihydroxybenzoic acid (protocatechuic) is also formed. The author finds that the numbers from a catechin described in a former communication, and to which he gave the formula $C_{19}H_{18}O_8$, agree equally well with the formula $C_{19}H_{20}O_8$, and as its properties are very similar to those of catechin, he thinks it probable that it is methylcatechin.

Solubility of Gallic Acid in Alkaline Citrates. F. Long. (*Phil. Med. Times*, Nov. 19, 1881.) The author has observed that gallic acid is very freely soluble in a solution of potassium citrate, and suggests the latter as a suitable solvent for the medicinal administration of the acid.

A New Derivative of Gallic Acid, and its Use as an Indicator for the Estimation of Combined Carbonic Acid. J. Oser and W. Kalmann. (*Wien. Akad. Ber.*, lxxxiii. [2], 161–167. From *Journ. Chem. Soc.*) In a former communication (*Wien. Akad. Ber.*, lxxii. [2], on the action of potassium permanganate and sulphuric acid on gallic acid, one of the authors described the formation of an acid, $C_{14}H_{10}O_8$, which he called tetra-hydroellagic acid. The authors, by fusing this acid with potassium hydroxide until a sample taken out gives a greenish yellow precipitate with sulphuric acid, have converted it into an isomeric acid. The new acid, $C_{14}H_{10}O_8$, crystallizes from water in fine greenish yellow microscopic needles with no water of crystallization. It can be heated in a stream of hydrogen to 200° without undergoing any change;

between 200° and 220° it begins to sublime; at 220–230° it becomes dark, and above this temperature is completely decomposed. It is soluble in hot water, alcohol, and ether, but only very sparingly in cold water. Its aqueous solution is coloured red-brown by ferric chloride, and olive-green by ferrous sulphate. Its alcoholic solution is rendered slightly turbid by an alcoholic solution of copper acetate, and with alcoholic lead acetate it gives a yellowish green precipitate, which quickly turns dark brown. If sodium or potassium hydroxide is added to the acid suspended in water, at first there is only an olive-green solution, but as soon as the alkali is in excess, the colour changes to carmine; this change is greatly accelerated by shaking with air. This solution has great tinctorial power; it is not altered by carbonic acid; but is turned yellow by the smallest excess of acid (dilute $H Cl$ and $H_2 S O_4$); it is hence recommended as an indicator in the titration of sodium and potassium hydroxide, and as the red colour is also produced by calcium and magnesium carbonates, it can be used in the estimation of the combined carbonic acid in water. Several analyses are given showing its efficiency.

The Absorption of Oxygen by Pyrogallol in Alkaline Solutions. T. Weyl and H. Zeitler. (*Zeitschr. für Analyt. Chem.*, 1881, 556.) The authors have determined the conditions under which the absorption of oxygen by alkaline solutions of pyrogallic acid proceeds most readily and completely. They find that the extent and facility of this absorption depends mainly upon the proportion and strength of the alkali present. It is most complete in the case of solutions containing 0·25 gram of pyrogallol in 10 c.c. of caustic potash solution of 1·050 specific gravity. With a more concentrated solution of potash the power of absorption diminishes.

Preparation of Succinic Acid from Tartaric Acid. F. König. (*Ber. der deutsch. chem. Ges.*, xv., 172. From *Pharm. Journ.*) The author shows that succinic acid may be prepared by the fermentation of tartaric acid under conditions sufficiently favourable to allow of the process becoming a means for its production for commercial purposes. The process consists in adding to a dilute solution of tartaric acid (1 kilo. in 20 litres), neutralized by ammonia, a small quantity of potassium phosphate (10 grams), magnesium sulphate (5 grams) and calcium chloride, and a few drops of a fermenting solution of ammonium tartrate. This mixture is kept sheltered as much as possible from excess of air, at a temperature of from 20–30° C., until the evolution of gas ceases and the tartaric acid has disappeared. The liquid is then evaporated

to drive off the ammonium carbonate, cleared with albumen, and boiled with milk of lime until there is a permanent alkaline reaction and ammonia is no longer given off. After cooling the calcium succinate is pressed and decomposed with sulphuric acid. In this way Herr König says he has obtained a yield of pure succinic acid equal to one-fourth of the weight of tartaric acid used. The reaction is supposed to be due to the splitting up of two-thirds of the tartaric acid into acetic acid, carbonic dioxide, and free hydrogen, and the reduction of the remaining third by the nascent hydrogen:—

$$2\ C_4H_6O_6 = 2\ C_2H_4O_2 + 4\ CO_2 + 4\ H.$$
$$C_4H_6O_6 + 4\ H = C_4H_6O_4 + 2\ H_2O.$$

Vulpic and Pulvic Acids. A. Spiegel. (*Ber. der deutsch. chem. Ges.*, xiv., 1686.) This paper is a continuation of the author's previous report upon the same subject (see *Year-Book of Pharmacy*, 1881, 63.) Vulpic acid is not attacked by ammonia, but it is saponified by the action of lime, forming methyl alcohol and pulvic acid, $C_{19}H_{14}O_5 + H_2O = C_{18}H_{12}O_5 + CH_4O$. Pulvic acid is decomposed by potassium or sodium hydroxide into dibenzylglycollic acid: $C_{18}H_{12}O_5 + 2\ H_2O = C_{16}H_{16}O_2 + 2\ CO_3$, and by baryta-water it is split up into phenylacetic and oxalic acids: $C_{18}H_{12}O_5 + 3\ H_2O = 2\ C_8H_8O_2 + C_2H_2O_4$.

The remainder of the paper deals with derivatives of dibenzylglycollic acid and with oxidation- and reduction-products of pulvic acid.

Berberonic Acid. H. Fürth. (*Monatsh. Chem.*, ii., 416.) The author confirms Weidel's view according to which this body must be regarded as pyridine-tricarboxylic acid. He describes three potassium salts of this acid as well as the chemical and physical properties of the acid itself.

On heating berberonic acid with glacial acetic acid in sealed tubes at 140° C., a new pyridine-dicarboxylic acid is formed, the properties of which will be found contrasted in a table concluding the paper with those of the five pyridine-dicarboxylic acids previously known.

Opianic Acid. O. Prinz. (*Journ. pr. Chem.* [2], xxiv., 353–374. From *Journ. Chem. Soc.*) Opianic acid is purified by passing a current of nitrogen trioxide through its hot aqueous solution on cooling the filtered solution, the acid separates out in almost white crystals, which can be obtained perfectly colourless by treating them with a little potassium permanganate and sulphuric acid. Nitrous acid does not act on opianic acid; dilute nitric oxidizes it slowly to hemipinic acid, and concentrated nitric acid converts it into

a mixture of nitro-opianic and nitro-hemipinic acids, and a small quantity of a substance having the composition of $C_{10}H_{10}NO_6$.

Nitro-opianic acid, $CHO.C_6H(NO_2)(OMe)_2.COOH$, is separated from the above by its insolubility in cold water; it crystallizes in pale yellow shining prisms, m. p. 166°. Its salts are easily soluble in water.

Barium nitro-opinate, $(C_{10}H_8NO_7)_2Ba + 3H_2O$, crystallizes in large yellow needles; *potassium nitro-opinate*, $C_{10}H_8NO_7K + 3H_2O$, forms thick transparent prisms; the sodium salt crystallizes in long deep yellow prisms. *Ethyl nitro-opinate*, $C_{10}H_8NO_7.C_2H_5$, crystallizes from carbon bisulphide in beautiful needles; it is soluble in alcohol, ether, and hot benzene; m. p. 96°. When melted under water it is resolved into the acid and alcohol.

Nitro-hemipinic acid, $C_6H(NO_2)(OMe)_2(COOH)_2 + H_2O$, is obtained from the mother-liquors of nitro-opianic acid, or better by heating equal weights of opianic acid and nitric acid until the evolution of red fumes ceases. The nitro-hemipinic acid is separated from the nitro-opianic acid by the insolubility of its barium salt in water. The acid obtained by decomposing the barium salt with sulphuric acid crystallizes in hard, vitreous, monoclinic prisms, containing water of crystallization; when anhydrous it melts at 155°. Nitro-hemipinic acid is not obtained by oxidizing nitro-opianic acid with nitric acid. Most of its salts are insoluble in water.

Barium nitro-hemipinate, $C_{10}H_7NO_8Ba + 2\frac{1}{2}H_2O$, is obtained as a white crystalline precipitate by adding barium chloride to the ammoniacal solution of the acid; the crystals effloresce.

Azo-opianic acid, $C_{20}H_{18}N_2O_{10}$, is obtained by reducing nitro-opianic acid with stannous chloride and hydrochloric acid; on cooling it separates as a voluminous precipitate of white needles. Ammonium sulphide reduces nitro-opianic acid in a similar manner. Azo-opianic acid dissolves in alkalies, and forms unstable compounds with acids; its hydrochloride loses hydrochloric acid when dried over lime or sulphuric acid. *Barium azo-opinate*, $N_2[C_6H(OMe)_2(CHO).COO]_2Ba + 6H_2O$, is obtained by dissolving the acid in baryta-water and removing excess of barium by means of carbonic anhydride; it forms fine silky needles. When boiled with baryta-water a golden-yellow precipitate is formed, which appears to be *barium amido-hemipinate;* its formation is explained as follows:—

$$N_2[C_6H(OMe)_2(CHO).COO]_2Ba + H_2O =$$
$$2C_6H(NH_2)(OMe)_2(COO)_2Ba.$$

Monochloro-opianic acid, $C_{10}H_9ClO_5$, is obtained by acting on opianic acid with hydrochloric acid and potassium chlorate; it crystallizes from water in brilliant needles, m. p. 210–211°. Its salts, except those of the alkali-metals, are sparingly soluble in water. A dichloro-acid appears to be formed by the further action of hydrochloric acid and potassium chlorate.

Bromine reacts on opianic acid, forming substitution-products.

Methylnoropianic acid, $C_6H_2(OMe)(OH)(CHO).COOH$, is prepared, as described by Matthiesen and Foster, by the action of hydrochloric acid on opianic acid. To purify the acid from unaltered opianic acid, the product is neutralized with ammonia, and barium chloride added; the filtrate from the precipitated barium opianate is treated with more barium chloride and made strongly alkaline with ammonia; in this way, a green gelatinous precipitate of barium methylnoropianate is obtained, which yields the free acid when decomposed by sulphuric acid. The barium salt becomes crystalline on standing, and has the composition,—

$$OMe.(CHO)C_6H_2 \left\langle \begin{matrix} -O- \\ COO \end{matrix} \right\rangle Ba + H_2O.$$

Monochloromethylnoropianic acid, $C_6HCl(OMe)(OH)(CHO).COOH$, is obtained by the action of potassium chlorate and hydrochloric acid on methylnoropianic acid. Crystallized from hot water, it forms large shining needles, m. p. 206°. Chloranil is obtained by the further action of hydrochloric acid and potassium chlorate on chloromethylnoropianic acid.

Phosphorus pentachloride reacts with hemipinic acid, forming hemipinic anhydride, m. p. 167°. Phosphorus pentachloride reacts with opianic acid to form a chloride, which has not been isolated; its ethereal solution, when treated with zinc and hydrochloric acid, yields meconin, and not opianic aldehyde.

Indigo, and its Artificial Production. Prof. H. E. Roscoe. (From a lecture delivered at the Royal Institution of Great Britain.) The author gives an elaborate account of the history of indigo, and of the various steps which have gradually led up to the successful synthesis of this substance. Owing to the very great interest which this important discovery has evoked, we give a copious extract from the author's lecture:—

Concerning the origin of indigo in the leaves of the *Indigofera*, various and contradictory views have been held. Some have supposed that blue indigo exists already formed in the plant; others, that white indigo is present, which on exposure to air is converted into indigo-blue. Schunck has, however, proved beyond

doubt that the woad plant (*Isatis tinctoria*), the *Indigofera tinctoria* of India, and the Chinese and Japanese indigo plant (*Polygonum tinctorium*) contain neither indigo-blue nor white indigo ready formed. It is now known that by careful treatment the leaves of all these indigo-yielding plants can be shown to contain a colourless principle termed *indican*, and that this easily decomposes, yielding a sugar-like body and indigo-blue. That white indigo is not present in the leaves is proved by the fact that this compound requires an alkali to be present in order to bring it into solution, whereas the sap of the plants is always acid. The decomposition is represented by Schunck as follows,—

$$\underset{\text{Indican.}}{C_{26}\,H_{31}\,N\,O_{17}} + 2\,H_2\,O = \underset{\text{Indigotin.}}{C_8\,H_5\,N\,O} + \underset{\text{Indiglucin.}}{3\,C_6\,H_{10}\,O_6}.$$

So readily does this change from indican to indigo take place, that bruising the leaf or exposing it to great cold is sufficient to produce a blue stain. Even after mere immersion in cold alcohol or ether, when the chlorophyll has been removed, the leaves appear blue, and this has been taken to show the pre-existence of indigo in the plant. But these appearances are deceptive, for Schunck has proved that if boiling alcohol or ether be used, the whole of the colour-producing body, as well as the chlorophyll, is removed, the leaves retaining only a faint yellow tinge, whilst the alcoholic extract contains no indigo-blue; but on adding an acid to this liquid, the indican is decomposed and indigo blue is formed.

What now was the first step gained in our knowledge concerning the constitution of indigo, of which the simplest formula is $C_8\,H_5\,N\,O$?

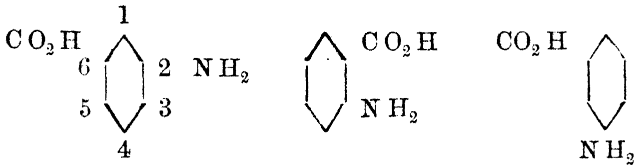
STEP No. 1.—This was made so long ago as 1840, when Fritsche proved that aniline, $C_6\,H_5\,N\,H_2$, can be obtained from indigo. The name for this now well-known substance is indeed derived from the Portuguese "anil," a word used to designate the blue colour from indigo. This result of Fritsche's is of great importance, as showing that indigo is built up from the well-known benzene ring, $C_6\,H_6$, the skeleton of all aromatic compounds, and moreover that it contains an amido group.

STEP No. 2 was also made by Fritsche in the following year, when, by boiling indigo with soda and manganese dioxide, he obtained ortho-amido-benzoic acid, or, as he then termed it, anthranilic acid. The following is the reaction which here occurs :—

$$\underset{\text{Indigo.}}{C_8\,H_5\,N\,O} + O + 2\,H_2\,O = \underset{\text{Ortho-amido-benzoic acid.}}{C_7\,H_5\,N\,H_2\,O_2} + C\,H_2\,O_2.$$

What light does this fact shed upon the constitution of indigo? It shows (1) that one of the eight atoms of carbon in indigo can be really separated from the rest; (2) that the carboxyl and the amido-group are in neighbouring positions in the benzene ring,

Ortho-position. Meta-position. Para-position.



viz., 1 and 2. For we have three isomeric acids of the above composition.

STEP No. 3.—The next advance of importance in this somewhat complicated matter is the discovery by Erdmann and Laurent, independently, that indigo on oxidation yields a crystalline body, which, however, possesses no colouring power, to which they gave the name of *isatin.*

$$\underset{\text{Indigo.}}{C_8H_5NO} + O = \underset{\text{Isatin.}}{C_8H_5NO_2}.$$

STEP No. 4.—The reverse of this action, viz., the reduction of isatin to indigo, was accomplished by Baeyer and Emmerling in 1870 and 1878, by acting with phosphorus pentachloride on isatin, and by the reducing action of ammonium sulphide on the chloride thus formed.

Three processes have been successfully employed in carrying out the synthesis of the body under discussion; but of these, only one is of practical importance, the others being too costly. The three processes have certain points in common: (1) They all proceed from some compound containing the benzene nucleus. (2) They all start from compounds containing a nitrogen atom. (3) They all commence with an ortho-compound. In other respects, however, they differ from one another. Process No. 1 starts from a compound containing seven atoms of carbon (instead of eight), and to this, therefore, one more atom must be added. Process No. 2, on the other hand, starts from a body which contains exactly the right number (eight) of carbon atoms; whilst No. 3 commences with a compound in which nine atoms of carbon are contained, and from which, therefore, one atom has to be abstracted before indigo can be reached.

Process No. 1 (Kekulé, Claissen and Shadwell).—So long ago as

1869 Kekulé predicted the constitution of isatin, and gave to it the formula which we now know that it possesses, viz.:—

$$C_6H_4<{CO \atop NH}>CO.$$

Following up this view, Claissen and Shadwell, two of Kekulé's pupils, succeeded in preparing isatin, and therefore now indigo, from ortho-nitro-benzoic acid.

The following are the steps in the ascent:—

1. Ortho-nitro-benzoic acid acted on by phosphorus pentachloride yields the chloride $C_6H_4(NO_2)COCl$.
2. This latter heated with silver cyanide yields the nitril $C_6H_4(NO_2)CO.CN$.
3. On heating this with caustic potash, it yields ortho-nitro-phenyl-glyoxylic acid, $C_6H_4(NO_2)CO.CO_2H$.
4. This is converted by nascent hydrogen into the amido-compound, $C_6H_4(NH_2)CO.CO_2H$.
5. And this loses water and yields isatin, $C_6H_4NH.CO.CO$.

The unpleasant nature and cost of such bodies as phosphorus pentachloride and cyanogen render this process unsuitable for adoption on a large scale.

Process No. 2.—Baeyer's (1878) synthesis from ortho-nitro-phenyl acetic acid.

This acid can be obtained synthetically from toluol, and it is first converted into the amido-acid, which, like several ortho-compounds, loses water, and is converted into a body called oxindol, from which isatin, and therefore indigo, can be obtained. The precise steps to be followed are:—

1. Ortho-amido-phenylacetic acid yields oxindol:

$$C_6H_4<{CH_2CO_2H \atop NH_2} = C_6H_4<{CH_2 \atop NH}>CO + H_2O.$$

2. This on treatment with nitrous acid yields nitros-oxindol:

$$C_6H_4<{C(NO) \atop NH}>CO.$$

3. This again with nascent hydrogen gives amidoxindol:

$$C_6H_4<{CH(NH_2) \atop NH}>CO.$$

4. Which on oxidation gives isatin:

$$C_6H_4 \left\langle \begin{matrix} CO \\ NH \end{matrix} \right\rangle CO.$$

This process, the feasibility of which had also been foreseen by Kekulé, is however not available as a practical scheme, for various reasons.

Process No. 3.—This may be called the manufacturing process, and was also proposed by Baeyer. It starts from cinnamic acid, a substance contained in gum benzoin, balsam of Peru, and some few other aromatic bodies. These sources are, however, far too expensive to render this acid thus obtained available for manufacturing purposes. But Bertagnini, in 1856, had obtained cinnamic acid artificially from oil of bitter almonds, and other processes for the same purpose have since been carried out. Of these, that most likely to be widely adopted is the following practical modification by Dr. Caro of Mr. Perkin's beautiful synthesis of cinnamic acid:—

$$1.\ \underset{\text{Toluene.}}{C_6H_5CH_3} + 4\,Cl = \underset{\text{Benzylene dichloride.}}{C_6H_5CHCl_2} + 2\,HCl.$$

$$2.\ \underset{\text{Benzylene dichloride.}}{C_6H_5CHCl_2} + \underset{\text{Sodium acetate.}}{2\,CH_3.CO.O.Na} =$$

$$\underset{\text{Cinnamic acid.}}{C_6H_5CH{=}CH.CO.OH.} + 2\,NaCl + CH_3CO.OH.$$

There are several reasons why Baeyer selected this nine-carbon atom for the manufacture of indigo. In the first place it had long been known that all indigo compounds when heated with zinc-dust yield indol, C_8H_7N, a body which stands therefore to indigo in the same relation as anthracene to alizarin, and Baeyer and Emmerling had, so long ago as 1869, prepared this indol from ortho-nitro-cinnamic acid, thus:—

$$C_8H_6(NO_2)CO_2H = C_8H_7N + O_2 + CO_2.$$

Secondly, the ortho-nitro-cinnamic acid required (for we must remember that indigo is an ortho-compound, and also contains nitrogen) can be readily prepared from cinnamic acid, and this itself again can be obtained on a larger scale. Thirdly, this acid readily parts with one atom of carbon, and thus renders possible its conversion into eight-carbon indigo.

The next steps in the process are: (3) the formation of ortho-nitro-cinnamic acid; (4) the conversion of this into its dibromide; (5) the separation from this of the two molecules of hydrobromic

acid, giving rise to ortho-nitro-phenyl-propiolic acid; (6), and lastly, the conversion of this latter into indigo by heating its alkaline solution with grape sugar, xanthate of soda, or other reducing agent. These reactions are thus represented :—

$$3.\ C_6H_5CH{=\!=}CHCOOH$$
Cinnamic acid.

yields

$$C_6H_4(NO_2)CH{=\!=}CHCOOH.$$
Ortho-nitro-cinnamic acid.

In this process the para-acid is also obtained, and as this is useless for the manufacture of indigo, it has to be removed. This is effected by converting the acids into their ethyl ethers, which, possessing different degrees of solubility, can be readily separated from one another.

4. This is next converted into the dibromide,

$$C_6H_4(NO_2)CHBr.CHBrCOOH.$$

5. And by careful treatment with caustic soda this yields ortho-nitro-phenyl-propiolic acid, thus :—

$$C_6H_4(NO_2)CHBrCHBrCOOH + 2NaOH = C_6H_4(NO_2)C_2.COOH + 2NaBr + 2H_2O.$$

$$6.\ n[C_6H_4(NO_2)C_2.COOH + H_2 = C_8H_5NO + CO_2 + H_2O].$$
Ortho-nitro-phenyl-propiolic acid. Indigotin.

The last of these reactions is in reality not so simple as the equation indicates. For only about 40 per cent. of indigo is obtained, whereas according to theory 68 per cent. should result. Indeed, although, as we have seen, indigo can be prepared by these three methods, chemists are as yet in doubt as to its molecular weight, the probability being that the molecule of indigo contains twice 16 atoms of carbon, or has the formula 4 (C_8H_5NO) or $C_{32}H_{20}N_4O_4$. Still, it must be remembered, that according to Sommaruga the vapour density of indigo is 9·45, a number corresponding to the simpler formula, $C_{16}H_{10}N_2O_2$.

The artificial production of indigo may even now be said to be within measurable distance of commercial success, for the ortho-nitro-phenyl-propiolic acid, the colourless substance which on treatment with a reducing agent yields indigo-blue, is already in the hands of the Manchester calico-printers, and is furnished by the Baden Company for alkali and aniline colours, at the price of 6*s*. per pound for a paste containing 25 per cent. of the dry acid.

The remainder of the author's paper deals with the nature of the competition between artificial and the natural indigo from a commercial point of view, and also with the mode of application of the artificial product in the process of calico printing.

Some New Compounds of Brazilein and Hæmatein. J. J. Hummel and A. G. Perkin. (*Chemical News*, from *Journ. Chem. Soc.*, 1882.) Commercial logwood extract is dissolved in hot water, and on cooling ammonia is added in slight excess. This solution is exposed to the air for two or three days, or air is aspirated through for several hours. A dark purplish granular precipitate of the ammonia compound of hæmatein is gradually deposited. This precipitate is collected and pressed, 40 grams are dissolved in a litre of hot water, and 30 to 160 c.c. of acetic acid (sp. gr. 1·04) added. The solution is heated for some time on a steam-bath, and then allowed to cool. The amorphous residue of hæmatein is filtered off, re-extracted with hot dilute acetic acid several times, and the combined filtrates evaporated on the steam-bath, when glittering crystals of hæmatein separate out. These are filtered off, washed with acetic acid, then with water, and dried. Thus prepared, hæmatein is sparingly soluble in water, alcohol, ether, and acetic acid; it dissolves readily in alkalies. Analyses indicated the formula $C_{16}H_{12}O_6$. The crystals are evidently indicated identical with those described by Haberstadt and Reis (*Ber. der deutsch. chem. Ges.*, xiv., 611). Hæmatein is destroyed by hot sulphuric acid; it, however, dissolves readily in cold concentrated sulphuric acid, producing a dark reddish brown solution. By adding hot glacial acetic acid very gradually to this solution, until it is diluted to the extent of two or three times its bulk, an orange crystalline precipitate is gradually thrown down. This, on analysis, gave the formula $C_{16}H_{12}O_6SO_3$. The authors suggest the name *sulphate of hæmatyl;* it is insoluble in alcohol, ether, and benzol, but is slightly soluble in strong acetic acid and cold ammonia. By digesting this substance with water and alcohol, a reddish brown crystalline powder was obtained, having the probable formula $(C_{16}H_{12}O_6)_3SO_3$. By the action of hydrochloric acid in sealed tubes on hæmatein a body was prepared having the formula $C_{16}H_{11}O_5Cl$, crystallizing in minute scarlet needles. By the action of hydrobromic acid a similar substance containing bromine was obtained. From commercial brazil extracts, by a similar process to that employed in the preparation of hæmatein, brazilein was obtained; dried at 100° its composition is $C_{16}H_{12}O_5, H_2O$; dried at 130° it was obtained anhydrous. By the action of sulphuric, hydrochloric, and hydrobromic

acids, compounds were prepared corresponding to those prepared from hæmatein. The tinctorial power of these new compounds is much greater than that of the original hæmatein and brazilein, and the colours are much faster. Although the authors did not form from hæmatein a body similar to the cœrulein obtained from gallein, they are of opinion that hæmatein probably belongs to the class of phthalleins.

Triethyl Meconate. H. Ost. (*Journ. für pract. Chem.* [2], xxiii., 439–443.) This compound is obtained by acting on silver diethyl meconate with ethyl iodide. It crystallizes from alcohol in needles melting at 61°, and yielding no coloration with ferric chloride. Its composition is represented by the formula $(C_2H_5)_3C_7HO_7$.

Action of Chlorinated Lime on Alcohols. Dr. A. Goldberg. (*Journ. pr. Chem.* [2], xxiv., 97–119, and *Journ. Chem. Soc.*, 1882, 28.)

1. *Action on Ethyl Alcohol.*—Schmitt and the author have previously shown that equivalent quantities of chlorinated lime and alcohol, when mixed, become heated, and there distils over much unaltered alcohol and a greenish yellow oil, which by the action of light or heat decomposes almost explosively, with evolution of chlorine, hydrochloric and hypochlorous acids. The products of the decomposition, treated with water, gave an aqueous solution of aldehyde, and an insoluble oil containing much monochloracetal and a little chloroform and dichloracetal; further, the oil seemed to contain a definite body boiling at 77–78°. The author has confirmed all these statements except the last, the liquid of constant composition and boiling point really consisting of several compounds.

A large quantity of the above oil, insoluble in water, was fractionally distilled, when monochloracetal, passing over between 150° and 160°, and dichloracetal at 185–190°, were obtained; crotonchloral (b. p. 163–165°), and acetal (b. p. 90–120°), could not be detected. The portions boiling between 70° and 150° were separated into two portions, one boiling at 70–80°, and the other above 150°, without any intermediate portions. Of the portion boiling at 70–80°, three-fourths of a litre was used for further fractionations; a small portion distilled below 70°, but the principal portions between 72–73° and between 77–78°, the percentages of chlorine in these fractions being 70·5 and 34·0. Sodium acted energetically on the latter, but scarcely at all on the former, which was found to be scarcely altered in composition by distillation over sodium. The distillate heated under pressure with hydrochloric acid, yielded a black

resinous body and an oily liquid, boiling entirely between 60–65°, containing 87·5 per cent. chlorine, and having a vapour-density of 4·24; it is chloroform. The author is not able to determine whether this chloroform exists ready formed in the oil, or whether it is formed during the heating with hydrochloric acid, since all fractions of the oil give the phenylcarbamine reaction; they moreover all give a mirror with silver solutions, and when shaken with water impart to it an aldehyde-like smell, so that the oil also contains some higher aldehyde.

Considering the small quantity of oil insoluble in water formed, in some cases absolutely none, it is evident that the formation of the monochloracetal is secondary to that of the aldehyde. The author supposing the original oil before explosion to be ethyl hypochlorite, explains the reaction thus:—

$$1.\ C_2H_5.OCl = CH_3.COH + HCl;$$
$$2.\ CH_3.COH + 2\,EtHO + Cl_2 =$$
$$HCl + H_2O + CH_2Cl.CH.(OEt)_2;$$

the unaltered alcohol in the second equation being that driven over by the energy of the reaction.

The action of chlorinated lime on monochloracetal was studied in order to get a clue to the formation of chloroform as above mentioned. With pure monochloracetal, a reaction first took place on the water-bath, a greenish yellow distillate going over. This soon decomposed, no longer however violently, with evolution of chlorine and hydrochloric acid gas, and separated into two layers, an aqueous hydrochloric acid and an oily chlorinated body. This latter contained much unaltered monochloracetal, but also di- and trichloracetal, which were isolated and identified by their composition, and the latter by its yielding chloroform on distillation with potassium hydroxide.

After the action of equivalent quantities of alcohol and chlorinated lime, the whole of the available chlorine is generally found to be exhausted; when twice the above quantity of alcohol was used with the same quantity of chlorinated lime, but very little more product was obtained, but it contained much more of the low boiling bodies (*i.e.*, 70–80°).

Action of chlorinated lime on dilute alcohol. Equivalent quantities of chlorinated lime and alcohol, the latter diluted with its own volume of water, when mixed, reacted on each other in about seven minutes, and the oily distillate decomposed violently; the oily products of the decomposition contained 3·4 per cent. crude chloroform,

boiling at 60–70°. With twice the above quantity of water the reaction commenced after from twelve to fifteen minutes, and the product contained 56·5 per cent. liquid, boiling at 60–70°, and above 100° only a few drops of a liquid smelling strongly of monochloracetal passed over. With three times the quantity of water, the distillation did not commence until after three-quarters of an hour, and was then imperfect, the product all distilled between 60° and 65°. With eight times the quantity of water, the reaction commenced in three-quarters of an hour, and had to be finally assisted by gentle heating, the product distilling over below 70°; and lastly, with a very large quantity of water, as in the manufacture of chloroform, the product distilled entirely between 60° and 63°. In 2 litres of chloroform residues of high boiling point, obtained from the manufacturer, no trace of monochloracetal could be detected.

These experiments show that on addition of water the quantity of monochloracetal—the lowest chlorinated product—decreases rapidly, whilst that of the lower boiling, but more highly chlorinated chloroform, increases as rapidly. The formation of traces of chloroform when absolute alcohol is used, the author considers to be due to the moisture in the chloride of lime, and that the addition of water, by diminishing the energy of the action, allows the chloride of lime to act further on the chlorinated acetal or chlorinated adehyde, resolving it into chloroform and formic acid. But judging from the fact that from 1 kilo. alcohol only 1 kilo. chloroform can be obtained, it is probable that but one-quarter of the total carbon goes to the formation of the chloroform, thus:—

$$4\,(C_2H_5.OH) + 16\,CaOCl_2 = 13\,CaCl_2 + 3\,(H.COO)_2Ca + 8\,H_2O + 2\,CHCl_3.$$

2. *Action of Chlorinated Lime on chemically pure Methyl Alcohol.*—Equivalent quantities were used, but no reaction took place spontaneously. When the mixture was heated on a water-bath, a distillate was obtained smelling strongly of hydrochloric and hypochlorous acids and chlorine, it did not decompose violently, and dissolved completely in water, with evolution of a gas which exploded on applying a light. The aqueous solution contained neither chloroform nor aldehyde. This, which is in accordance with the observations of others, bears out the opinion that the chlorine never enters the carbinol residue, which is oxidised to formic or carbonic acid.

The remainder of the author's paper deals with the action of chlorinated lime on isopentyl alcohol.

Rectification of Alcohol. R. Pictet. (*Pharmaceut. Zeitung*, 1881, 539, from *Revue univers. de la Brass et Dist.*) The author recommends the distillation of alcohol to be carried out in vacuo, and the vapour to be condensed by means of an ice refrigerator. By a combination of these two conditions a very superior product is obtained.

Detection of Fousel Oil in Alcohol. A. Jorisser. (*Biel. Centr.*, 1881, 791.) 10 c.c. of the spirit to be tested are mixed with 10 drops of colourless aniline and 2 or 3 drops of sulphuric acid. In the presence of not less than $\frac{1}{10}$ per cent. of fousel oil a red coloration will thus be produced. If the impurity amounts to less than this proportion, it is necessary to shake up a larger quantity of the spirit with chloroform, and to apply the test to the residue left after the evaporation of the decanted chloroform.

Nature of the Alcoholic Ferment. D. Cochin. (*Bied. Centr.*, 1881, 345.) When a fermenting sugar solution is carefully filtered, no further fermentation takes place in the perfectly clear filtrate. The author regards this fact as a proof of the absolute insolubility of the alcoholic ferment.

The Purity of Chloroform. P. Yvon. (*Journ. de Pharm. et de Chim.*, 1882.) The author finds that absolutely pure chloroform does not reduce permanganate, while impure chloroform does; and on the strength of this observation proposes the following test for ascertaining the purity of this substance:—5 c.c. of the chloroform to be tested are to be shaken with 1 c.c. of a solution containing 1 part of potassium permanganate and 10 parts of caustic potash, in 250 parts of water. With pure chloroform the violet colour will remain unchanged, whereas with an impure article it will change to green, either instantly or within less than ten minutes. He attributes this reduction to the presence of chlorinated compounds.

The agitation with alkaline permanganate solution, with subsequent drying and rectification, is also suggested by the author as an efficient process for purifying chloroform intended for anæsthetic purposes.

The Purity of Chloroform. D. B. Dott. (From a paper read before the North British Branch of the Pharmaceutical Society, March 8, 1882, and published in *Pharm. Journ.*, 3rd series, xii., 769.)

The author criticises the process recently recommended by P. Yvon for ascertaining the purity of chloroform for anæsthetic purposes (see the preceding abstract). His experiments indicate that the reducing action upon permanganate is due to the presence of alcohol, and not to that of chlorinated compounds. As a minute

proportion of alcohol occurs in even the best samples of British chloroform, and is not considered an objectionable impurity, the author regards Yvon's process as of little practical value.

The Detection of Chloral Hydrate. F. Ogston. (*Zeitschr. für Analyt. Chem.*, 1882, 124.) If a weak solution of chloral hydrate be mixed with a little yellow sulphide of ammonium, the mixture after some time assumes an orange-yellow coloration, which gradually darkens, ultimately becoming brown, while at the same time a disagreeably smelling gas is evolved. Finally an orange precipitate is formed. If, soon after the addition of the ammonium sulphide, the mixture be heated, the precipitation occurs at once, and the precipitate in this case is more of a red colour.

Butyl-chloral and the so-called croton-chloral give the same reaction, which however is not produced by other substances.

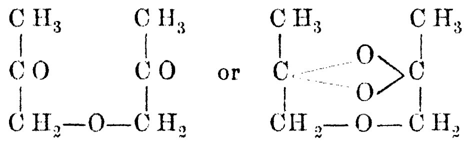
Solubility of Iodoform. Dr. Vulpius. (*Archiv der Pharm.*, Jan., 1882.) Hot glycerin dissolves 1 per cent. of iodoform, more than one-half of which separates on cooling. Hot olive oil takes up about 20 per cent. of iodoform, of which 2 per cent. remains in solution after cooling. The solution in chloroform rapidly becomes dark red, probably in consequence of a mutual reaction between the two compounds. With collodion a 10 per cent. solution of iodoform can be readily prepared by agitating the latter with a little ether and afterwards with the collodion, and even a 15 per cent. solution may be made. The following table shows the proportion of iodoform soluble in various solvents:—

100 parts of	Petroleum benzin	dissolve	1 part	of Iodoform.
,,	Benzol	,,	1·5	,,
,,	Absolute alcohol	,,	4	,,
,,	Oil of turpentine	,,	4	,,
,,	Oil of lavender	,,	7	,,
,,	Oil of cloves	,,	8	,,
,,	Oil of fennel	,,	9	,,
,,	Oil of lemon	,,	9	,,
,,	Oil of rosemary	,,	9	,,
,,	Oil of cinnamon	,,	14	,,
,,	Oil of caraway	,,	16	,,
,,	Ether	,,	16	,,

Glyceryl Ether. B. Tollens and A. Loe. (*Ber. der deutsch. chem. Ges.*, xiv., 1946.) This body (previously obtained by Gegerfield, Linnemann, von Zotta, and Tollens) may be readily obtained by distilling glycerol with $\frac{1}{50}$ of its weight of ammonium chloride, collecting the fraction boiling between 220 and 270° C., neutralizing this with potassium carbonate, then distilling in a

current of steam, and finally adding potassium carbonate to the distillate, whereupon the ether rises to the surface as an oily liquid. When dried, the product boils at from 170–173° C. It has a slight reducing action on Fehling's solution, which is greatly increased by previous warming with dilute hydrochloric acid. When treated with warm acids, and subsequently with soda and iodine solution, it yields iodoform.

From its formula, $C_6 H_{10} O_3$, glyceryl ether would appear to be a dehydrated derivative or ether of acetol, $C_3 H_6 O_2$. Its constitutional formula is represented by the authors as



Preparation of Sodium Diglycerate. W. F. Loebisch and A. Loos. (*Monatshefte für chemie*, Dec., 1881. From *Chem. and Drugg.*) Sodium monoglycerate may be prepared either by acting upon anhydrous glycerin with metallic sodium or by the mutual reaction of sodium ethylate and glycerin, the latter method being the best. Up to the present all attempts to replace a further atom of hydrogen in glycerin with an atom of sodium have failed. The authors, have, however, succeeded in effecting this substitution by treating alcoholic sodium monoglycerate with sodium ethylate, and boiling the mixture for several hours under a stream of hydrogen in a vessel connected with an inverted Liebig's condenser. Thus prepared and kept under hydrogen, sodium diglycerate forms a glossy white porous mass, which soon crumbles to a crystalline powder. Exposed to the air it absorbs moisture with great avidity, deliquescing finally to a corrosive syrup. Sodium diglycerate melts at 220° C., with the formation of bubbles; at 270° C. it admits of distillation, the distillate consisting of a brown liquid.

Quantitative Separation of Rosin from Fats. T. T. Gladding. (*Amer. Chem. Journ.*, iii., 416.) The alcoholic solution of the resinous and fatty acids is treated with neutral silver nitrate, which throws down the fatty acids as silver salts, leaving the silver resinate in solution. The precipitate having settled down, the clear liquid is mixed with ether and shaken up with dilute hydrochloric acid till the dissolved silver salt is completely decomposed; and after all the resulting silver chloride has subsided, the ethereal solution is syphoned off and evaporated to dryness over a water-bath.

The residue consists of rosin containing a small quantity of oleic acid, which can be accurately allowed for. The chief use of the process is for the estimation of rosin in soap, to which it may be applied directly without previous decomposition of the soap by acids. Its success, however, requires attention to a number of details, for which the original paper must be consulted.

Preparation of Lactic Acid. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, xv., 699–701.) The author recommends the following modified process:—500 grams of raw sugar, 250 grams of water, and 10 c.c. dilute sulphuric acid (3 parts by weight of H_2SO_4 to 4 of water) are heated for three hours at 50°; to the cooled inverted sugar solution, 400 c.c. of saturated sodium hydrate solution are added gradually by 50 c.c. at a time. The mixture rapidly darkens, and the temperature rises almost to boiling if the sodium hydrate be added in too large quantities. The mixture is then heated at 60–70°, until it gives no reaction with Fehling's solution. Sulphuric acid of the strength mentioned above is then added to neutralize the excess of soda, and the sodium sulphate crystals are separated; the rest of the sulphate is removed by the addition of 90 per cent. alcohol. The alcoholic solution is drained from the crystals; half of it is neutralized with zinc carbonate, boiled, and filtered when hot into the remaining half. The zinc salt, amounting to 30–40 per cent. of the weight of the sugar, crystallizes out on cooling, and, after separation from the mother-liquor, is obtained pure after a single crystallization; a further crop of zinc lactate may be obtained from the mother-liquor.

A New Apparatus for the Determination of Melting Points. C. F. Cross and E. J. Bevan. (*Pharm. Journ.*, from a paper read before the *Chemical Society*, Jan. 19, 1882.) The apparatus consists of a small platform of thin ferrotype iron or silver, having an opening for the reception of a thermometer bulb and a small indentation or depression, about 1·5 mm. deep and 2 mm. in diameter. A very small quantity of the substance is melted in the little depression, and while still liquid a thin platinum wire, bent like an L and fused into a glass float, is immersed in the liquid and held there until the substance solidifies; a thermometer is then inserted into the opening, and the whole apparatus plunged under mercury; the mercury is gently heated and the thermometer carefully watched. As soon as the substance melts the float rises instantly and the temperature is noted. Stirring is unnecessary; the whole of the substance is surrounded with mercury, and the attention can be concentrated on the thermometer.

The Essential Oil of Pinus Pumilio. A. Atterburg. (*Ber. der deutsch. chem. Ges.*, xiv., 2530. From *Pharm. Journ.*) The author has separated from the essential oil prepared from the acicular leaves of *Pinus pumilio*, four bodies belonging to the terpene group. The first terpene has a boiling point between 156° and 160° C., is lævorotatory (– 6·66), smells like well purified oil of turpentine, and is identical with the modification of that oil known as "terebenthene." The second terpene boils between 171° and 176° C., is also lævorotatory (– 5·39) and has the odour of "sylvestrin," a body isolated by the author from pine-wood tar, with which it is probably identical. The third terpene is a pleasant smelling lævorotatory (–6·2) liquid, boiling at 250° C., but then undergoing decomposition; it was obtained as a colourless liquid, quickly becoming yellowish by absorption of oxygen, by distilling with the vapour of water, and is one of the sesquiterpenes ($C_{15} H_{24}$). The fourth product was a reddish thick non-volatile liquid, almost solidifying in the cold, which appeared to have the composition of a slightly oxidized terpene. Two terpenes were some time since separated from the essential oil of Pinus sylvestris by Dr. Tilden (*Pharm. Journ.* [3], viii., 539), which resembled the first two in their boiling points, but one of them was dextrorotatory (+ 18·48'); otherwise they are probably identical. The author looks upon the fragrant terpene as a hitherto unknown body.

The Essential Oil of the Fruit of Coriandum Sativum. B. Grosser. (*Ber. der deutsch. chem. Ges.*, xiv., 2485–2508. From *Journ. Chem. Soc.*)—The oil used has sp. gr. 0·8719 at 15°, refractive index = 1·464; at 15°, with Wild's polaristrobometer, $[a]_D = -92·55$; another sample sp. gr. 0·8720, gave $[a]_D = -88·4$. Analysis led to the formula $C_{10} H_{18} O$. When fractionally distilled, the portion which passes over at 150–170° is turbid from the presence of water, but above this temperature the distillate is clear. Analysis of fraction 165–170° gave numbers for $C_{20} H_{34} O$; and of fraction 190–196° gave the same results as the original oil. Both the oil and fraction 190–196° dissolve completely in cold alcoholic sulphuric acid (90 per cent. alcohol, 2 parts; sulphuric acid, sp. gr. 1·840, 1 part), a property also evinced by the monohydrate of lævorotatory turpentine oil. The fraction 165–170° also dissolves to a clear solution, but soon becomes turbid from separation of a terpene. A mixture of $C_{10} H_{18} O$ and $C_{10} H_{16}$ never dissolves to a clear solution, the fraction 165–170° is therefore not a mixture of these bodies, but a definite compound; for, by repeated distillation, it boiled between 168–170°; its formation is thus explained, $2 C_{10} H_{18} O =$

$C_{20}H_{34}O + H_2O$. By distillation with phosphoric anhydride, oil of coriander yields a terpene, water being eliminated (Kawalier); the same change takes place when the oil is heated alone in a sealed tube at 200° for some time. Sodium acts on the oil, hydrogen being evolved, and the body $C_{10}H_{17}ONa$ being formed; on decomposing this with dilute hydrochloric acid, instead of getting back $C_{10}H_{18}O$, the body $C_{20}H_{34}O$ (b. p. 168–170°) is obtained. By conducting the experiment with sodium at 150–170° and decomposing the product with hydrochloric acid, the terpene, $C_{10}H_{16}$ (b. p. 178–180°), is formed. By digesting the oil with acetic acid at 150–180° in a sealed tube, a body of the formula $C_{20}H_{34}O$ is produced; with acetic anhydride, however, an acetate is formed, $C_{10}H_{17}.\bar{A}cO$. Dry hydrochloric acid gas is absorbed by coriander oil with great avidity, water being formed: the oil, $C_{10}H_{17}Cl$, produced is of a feeble yellowish colour; has a neutral reaction, and a not unpleasant camphor-like odour; its sp. gr. = 0·9527 at 15°; when heated it decomposes, giving off hydrochloric acid. The absorption of hydriodic acid gas is very violent, often explosive, and the product explodes violently when warmed, even below 100°; the iodine estimation agrees with the formula $C_{10}H_{17}I$. These experiments tend to show that coriander oil has a hydroxyl-group, and its formula is therefore $C_{10}H_{17}.OH$. The iodide, $C_{10}H_{17}I$, gradually undergoes decomposition, and by carefully heating it after decomposition has set in to about 140°, iodine and hydriodic acid are evolved, and after about half an hour the action is complete; *cymene* was recognised amongst other products.

Oxidation experiments with nitric acid were useless, for with strong acid the action is too violent, and with dilute acid there is no action at all.

With alkaline potassium permanganate the oxidation takes place in stages, according to the strength and quantity employed. With a concentrated solution of permanganate the action is extremely violent; with a more dilute solution the reaction is steadier, and the products are *acetic* and *oxalic acids* and *carbonic anhydride.* By adding a 1 per cent. solution of the permanganate to the oil, at the same time cooling, until all the oil has disappeared from the surface, filtering off the manganese hydrate, and separating from the *potassium carbonate* by crystallization and extraction with alcohol, a product is obtained which shows no tendency to crystallize. This product is treated with phosphoric acid and distilled with steam. The only volatile acid present is *acetic.* From the residue an acid, $C_6H_{10}O_4$, is separated, which does not crystallize, or form

crystalline salts; it forms percipitates, however, with basic lead acetate and iron chloride, and may, therefore, possibly be *dimethyl-succinic acid*. If, however, dilute permanganate is used in quantity insufficient for complete oxidation, the product consists of a ketone $C_{18} H_{13}$. C O Me, which is a yellowish oil (sp. gr. 0·8970: b. p. 185 -186°); does not solidify, even at 37°; is volatile with steam, and forms a crystalline compound with hydrogen sodium sulphite which melts when touched with the finger, and chars when heated. Oxidized with potassium permanganate, it yields the acid $C_6 H_{10} O_4$, acetic acid, and carbonic anhydride, and finally, by further oxidation, oxalic acid.

Oil of Wild Thyme. R. Feboe. (*Comptes Rendus.*, xcii., 1290, 1291).—A preliminary distillation separated the liquid into two products—one colourless, boiling at 170–200°, the other, strongly coloured, boiling between 200–250°. The first liquid was fractionated over sodium, and obtained of tolerably constant boiling point, 175–177°. It is a colourless liquid, with an odour of lemons, having a density of 0·873 at 0°, and a very feeble rotatory power. The density of its vapour, determined at 192·5° under 748 mm. pressure, was 4·78. The theoretical density of the hydrocarbon, $C_{10} H_{14}$, is 4·63, with which formula the percentage composition also agreed.

Ordinary sulphuric acid had no action upon it, but the Nordhausen acid dissolved it without elevation of temperature, and without disengagement of sulphurous anhydride; the resulting liquid was red, and entirely soluble in water.

From the foregoing there can be no doubt that the liquid is a cymene, $C_{10} H_{14}$, containing probably some traces of a camphene hydrocarbon, to which perhaps its feeble rotatory power is due.

The higher boiling portions consisted chiefly of an oxidized body, which was isolated by dissolving it in a solution of caustic soda and decanting the insoluble hydrocarbons. The phenol was then separated by treatment with dilute hydrochloric acid and shaking with ether; after several rectifications, it furnished a product boiling regularly at 233–235°. It is a colourless oily liquid with a pungent odour recalling that of the original oil. Its density at 0° was 0·988, but it does not solidify in a mixture of ice and salt; however, the analysis corresponded well with the formula $C_{10} H_{14} O$, which shows it to be a thymol.

Treated with acetic chloride, it gives the acetic salt of thymol, which is a colourless liquid of pleasant odour, boiling at 244–245.°

Oil of Wine. E. C. Harting. (*Journ. für pract. Chem.* [2], xxiii., 449–480. From *Journ. Chem. Soc.*) After noting the results obtained

by previous investigators with the oily liquid obtained from small preparations of ether or ethylene, the author gives an account of his examination of the products from the manufacture of ether on a large scale. In the technical conversion of alcohol into ether by sulphuric acid, the vessels are kept in uninterrupted use for four weeks, during which time about 800 kilos. of alcohol are used. After the ether is distilled off, the residue consists of a tarry substance, which is a high condensation-product examined by Marchand (*Berz. Jahresber.*, xix., 504), and a liquid.

The liquid, freed from sulphuric acid, ether, alcohol, and water, has a neutral reaction. Sp. gr. 0·903 at 17·5°. It is clear, yellowish, of a sweet taste, and is not decomposed even on boiling with water or alkalies; it does not contain sulphur, nor does it deposit crystals on cooling to 0°. The liquid was submitted to systematic fractioning, by Linnemann's method, and each fraction examined separately.

Fraction boiling at 112–113°, gave numbers agreeing with the formula $C_7H_{10}O$, and from its behaviour with hydriodic acid, and the analysis of the iodides, was found to be ethylamyl oxide.

Fraction 150–160°. After shaking up with hydrogen sodium sulphite, removing the sodium compound and distilling, a colourless mobile liquid, with camphor-like odour, was obtained (b. p. 153–155°), insoluble in water, soluble in alcohol; sp. gr. 0·8405. It yielded on reduction a secondary alcohol (b. p. 163–165°), $C_8H_{18}O$, with a musty odour, and forming a crystalline compound with calcium chloride; and on oxidation valeric and propionic acids were formed; it was therefore "ethylamylketone."

The sodium sulphite compound gave "methylhexylketone" (b. p. 163–165°), recognised by its breaking up into caproic and acetic acids on oxidation.

In another instance, besides the two ketones, a hydrocarbon was obtained (b. p. 156·5–158°), which on examination of the bromine-compounds obtained from it, proved to be "rutylene."

The other fractions contain mixtures of these bodies as well as another hydrocarbon, ether, and ketone.

This product from the preparation of ether on a large scale is quite different from those examined by previous workers.

Oil of Angelica. W. Naudin. (*Comptes Rendus*, xciii., 1146.) The volatile oil obtained from the fruit of *Archangelica officinalis* by distillation with water has an agreeable odour and a specific gravity of 0·872. By exposure to the light it soon becomes coloured yellow, and by exposure to the air, through absorption of oxygen, becomes resinified. Under ordinary pressure it has no constant

boiling point; it begins to boil at 174° C., although portions pass over even at 330° C. By distillation in vacuo, 75 per cent. of distillate is obtained, which, under a pressure of 22 millimetres, boils at precisely 87° C. This liquid has the formula $C_{10}H_{16}$, and is thus isomeric with turpentine oil, but is different, however, from similarly composed hydrocarbons; it is colourless, has an odour reminding of hops, and an injurious effect upon the organs of respiration, which is similar to that produced by fusel oil. Its boiling point is 175° C., the specific gravity 0·833, and coefficient of rotation + 25° 16′; the latter decreases constantly when the oil has been heated to 100° C., in a sealed glass tube, until it reaches a minimum of + 9° 44′. The liquid thereby becomes thick, and polymerized to a hydrocarbon, resembling the β-isoterebenthenes, which is already contained in the crude angelica oil, and for which the author proposes the name of terebangelene. By the action of the halogens a violent reaction ensues, with the formation of cymol.

In a specimen of the oil two years old, and containing moisture, the author observed a white crystalline body, containing oxygen, probably a hydrate of terebangelene, but the small quantity obtained prevented further study.

The root of the plant furnishes an essential oil of acrid taste and smell, which the author intends to study, with the view of establishing its identity with the oil from the fruit.

Oil of Mastic. (*Pistacia lentiscus.*) Prof. F. A. Fluckiger. (*Archiv der Pharm.* [3], xix., 170.) Mastic usually contains only traces of volatile oil; but the author has met with specimens yielding as much as 2 per cent. The oil is a true terpene of the formula $C_{10}H_{16}$, and has a strong but pleasant odour. Its rotatory power is +28°; that of chio turpentine is +11·5°. When dissolved in an equal volume of carbon bisulphide and saturated with hydrochloric acid gas, it does not form a solid compound; and in this respect, too, it differs from the oil of Chio turpentine. Mastic oil boils at 155–160° C.

Essential Oil of Satureja Montana. A. Haller. (*Comptes Rendus*, xciv., 132.) This oil is a thin, orange-yellow liquid of aromatic odour and ·7394 specific gravity at 17° C. In a column of 200 mm. its rotatory power at 17° C. is $(\alpha)_D = -6·50°$. Solution of caustic soda takes up 30–40 per cent of the oil; and after removing the insoluble hydrocarbon from the alkaline solution, the latter, when acidified, yields a liquid phenol boiling at 232–234° C., which the author proves to be identical with carvacrol. The hydrocarbons contained in the essential oil can be separated by fractional distil-

lation into two terpenes, boiling at 172–175° and 180–185° C. respectively.

Essential Oil of Satureja Hortensis. E. Jahns. (*Ber. der deutsch. chem. Ges.*, xv., 816.) The author's investigation of this oil shows it to contain the following constituents:—

Carvacrol	30 per cent.
Cymol	20 ,,
A terpene, boiling at 178–180° C. .	50 ,,

The carvacrol of this oil is associated with traces of another phenol which is not taken up from the alkaline solution by ether.

Essential Oil of Santalum Album. P. Chapoteaut. (*Bull. Soc. Chim.*, xxxvii., 303.) 100 parts of this sandal wood yield upon distillation with steam 1·25–2·8 parts of an essential oil which is a thick liquid of ·945 specific gravity, boiling at 300–340°. The oil consists of two substances boiling at 300° and 310° C. respectively, and answering to the formulæ $C_{15}H_{24}O$ and $C_{15}H_{26}O$. The latter of these two bodies is an alcohol, and the former the corresponding aldehyde. Phosphoric anhydride absorbs water from both, converting them into hydrocarbons of the formulæ $C_{15}H_{22}$ and $C_{15}H_{24}$ respectively.

Bichlorated Camphor. P. Cazeneuve. (*Pharm. Journ.*, from *Comptes Rendus*, xciv., 739.) Hitherto the only chlorated derivative of camphor known was monochlorated camphor ($C_{10}H_{15}ClO$), obtained by Weber through the action of hypochlorous acid on camphor. The author has now succeeded in preparing bichlorated camphor ($C_{10}H_{14}Cl_2O$) by passing a current of dry chlorine through a solution in molecular proportions of camphor in absolute alcohol, at a temperature between 80° and 90° C. There is a considerable evolution of hydrochloric acid, with formation of some chloral, which is removed by treatment with water in a water-bath until the product has no longer an acid reaction, when, upon cooling, the bichlorated camphor forms a crystalline mass, and by recrystallization from 93° alcohol can be obtained in large white prisms. It is insoluble in water, and soluble in chloroform and carbon bisulphide. In cold alcohol it is but slightly soluble, but the solubility augments with increase of temperature, until at ebullition it appears to dissolve in all proportions. It is extremely soluble in ether, liquefying in contact with even its vapour. It melts at 96° C., and has a density of 4·2. When triturated with chloral hydrate it does not liquefy like ordinary camphor.

Pyroguajacol. H. Wieser. (*Wien. Akad. Ber.* [2 *Abth.*], 464–478. From *Journ. Chem. Soc.*) Pyroguajacol is the oily body which passes over last when guaiacum is submitted to dry distillation. According to the author it consists of $C_6 H_6 O$ (or more probably $C_{18} H_{18} O_3$), whilst Ebermayer states that it consists of $C_7 H_7 O$, and Hlasiwetz gives the formula as $C_{19} H_{22} O_3$.

It crystallizes in tolerably large rhombic plates (m. p. 180·5°, uncorr.), sparingly soluble in boiling water, alcohol, and ether. The alcohol solution gives no reaction with ferric chloride. It dissolves in sulphuric acid with a dark blue colour, and on adding water a dark blue flocculent precipitate is thrown down, whilst the liquid above appears colourless.

When sublimed, pyroguajacol forms small masses of needles mixed with plates; but when it is heated very slowly, distinct pointed needles are obtained. Sublimed in hydrogen it forms tolerably large plates.

Acetylpyroguajacol, $C_{18} H_{16} O_3 \bar{A}c_2$, formed by heating pyroguajacol with acetic chloride in a glass tube, consists of colourless needles (m. p. 122°).

Dibenzoyl-pyroguajacol, $C_{18} H_{16} O_3 Bz_2$, is formed by acting on pyroguajacol with benzoic chloride. It crystallizes imperfectly, and melts at 179°.

Tribromopyroguajacol, obtained by dissolving pyroguajacol in acetic acid, and adding bromine drop by drop, forms yellowish red needles (m. p. 172°), which are sparingly soluble in alcohol.

When pyroguajacol is distilled over zinc dust, brilliant plates (m. p. 100–101°) are obtained, which exhibit a faint blue fluorescence, and form a brownish yellow prismatic compound with picric acid. The author proposes to call this new hydrocarbon ($C_{12} H_{12}$), *guajene*.

On oxidizing an acetic acid solution of guajene with nitric acid, it yields a new body ($C_{12} H_{10} O_2$) of an orange colour, which may be regarded as guajaquinone.

When pyroguajacol is heated with potassium hydroxide, a body is formed which, when treated with dilute sulphuric acid, yields greyish white flocculent masses (m. p. 202°), easily soluble in alcohol and ether. These probably consist of $C_{12} H_{12} O_2$.

From the above facts the rational constitution of pyroguajacol would seem to be $H\,O.\,C_{12} H_{10}.\,O.\,C_6 H_6.\,O\,H$.

Artificial Vanillin from Oil of Cloves. (*Chem. and Drugg.*, 1881, 442.) Essential oil of cloves is diluted with three times its volume of ether, and agitated with a very diluted aqueous solution of potash. An alkaline solution of eugenol is formed, which is separated, the

alkali neutralised by acid, and the eugenol dissolved in sufficient ether. The ether is distilled off, and the eugenol treated with anhydrous acetic acid. The aceto-eugenol thus formed is oxidized by a weak and warm solution of permanganate of potash. The product is filtered, rendered slightly alkaline, and concentrated. Lastly, it is acidulated, and agitated with ether to remove the vanillin.

The Physiology and Chemistry of Starch. Dr. Meyer. (*Pharm. Journ.*, 3rd series, xii., 279.) The author gives an account of the most recent view of the growth and development, as well as the chemical and physical properties, of starch. He agrees with Schimper and Musculus (*Bot. Zeit.*, 1880–81), according to whom the starch grains grow, like sphærocrystals, by apposition of starch molecules. The starch grains are sphærocrystalloids which originate only in the chlorophyll grains of the green parts of plants, whilst in all parts destitute of chlorophyll, as for instance in rhizomes, starch grains are produced by the conversion of other carbohydrates into starch by the so-called starch-formers. To explain the origin of the concentric rings, and the peculiarity of starch grains always being softer in the interior than on the outside, the author makes use of a new theory which cannot be here entered upon. Chemically, only the outermost layer of the starch grain consists of anhydride, $(C_6H_{10}O_5)_{12}$, the inner layers are composed of "*swollen*" anhydride. By the action of acids and ferments water is taken up and the molecule of anhydride breaks up into several molecules of soluble starch, hydrate of starch $(C_6H_{10}O_5)_3 + H_2O$, which can be obtained in sphærocrystals. By the action of ferments soluble starch is converted into dextrin and maltose, water being again absorbed—

$$(C_6H_{10}O_5)_{12} + H_2O = \underbrace{(C_6H_{10}O_5)_{10}}_{\text{Dextrin.}} + \underbrace{C_{12}H_{22}O_{11}}_{\text{Maltose.}}.$$

This decomposition may be continued; maltose can then, on absorption of one molecule of water, split up into two molecules of grape sugar. The first step towards the production of starch from grape sugar has been accomplished in the preparation of a dextrin, of the formula $(C_6H_{10}O_5)_3$, from chemically pure grape sugar.

Anhydrous Sugar of Milk. M. Schmoeger. (*Ber. der deutsch. chem. Ges.*, xiv., 2121.) The author's experiments confirm previous observations, that solutions of ordinary milk sugar, when evaporated over a briskly boiling water-bath, and especially when evaporated together with some water-absorbing substance, leave the sugar in an anhydrous condition. The same is the case when milk is evaporated.

Decomposition of Grape-Sugar by Alkalies. M. Nencki and N. Sieber. (*Journ. für pract. Chem.*, xxiv., 498.) Grape-sugar, when digested with solution of potash or soda at 35–40° C. for some time, is decomposed into lactic acid and an acid of unknown constitution. The latter is insoluble in ether but soluble in alcohol.

Levulose. MM. Jungfleisch and Lefranc. (*Comptes Rendus*, xciii., 547.) The authors show that levulose, when pure, can be obtained in a crystalline form. It is best prepared from inulin; and the pure product from this source does not differ in the slightest degree from that obtained from inverted cane-sugar. It forms spherical groups of fine colourless crystals, fusing at 95° C. The authors give full details respecting the best mode of preparing it from the two sources named.

The Alleged Conversion of Starch into Sugar by Water at High Temperatures. F. Soxhlet. (*Bied. Centr.*, 1881, 554.) The partial conversion of starch into sugar by heating with a small quantity of water under high pressure is shown by the author to be due to the traces of free acid generally accompanying commercial potato and wheat starch. Perfectly neutral starch does not yield any sugar under the same conditions.

The Action of Diastase on Starch. A. Herzfeld. (*Bied. Centr.*, x., 203. From *Journ. Chem. Soc.*) According to the latest researches, the end products of this reaction are maltose and achroodextrin. In order to obtain crystallized maltose, the author recommends that a solution of the substance in hot 80–85 per cent. alcohol be left for some time in the cold, and the alcohol evaporated. Maltose probably forms an uncrystallizable hydrate in warm solutions, which is transformed into a crystalline anhydride in the cold. It is known that the saccharification of starch by diastase is most successful at a temperature of 65°, and is retarded by a higher temperature, and in this case, as shown by Maercker, no crystallizable maltose is obtainable; the author, however, has succeeded in separating a body which he believes prevents the crystallization. His method is as follows:—The mass resulting from the saccharification is dissolved in a small quantity of water, and precipitated with 90 per cent. alcohol, the operation repeated 10 to 12 times, the residue dried on glass plates, scraped off, powdered, and dried at the same temperature; the alcoholic filtrate is distilled off, and its residue is treated in the same manner. This substance approaches very nearly to maltose in its reducing power. The substance which is precipitated by the alcohol is an uncrystallizable gum, only slightly more soluble in warm than in cold alcohol, and

quite insoluble in strong alcohol and ether, but readily soluble in water; this property distinguishes it from maltose as well as from erythro- and achroo-dextrin. The author calls it malto-dextrin, and believes it to be identical with the γ-dextrin of Bondonneau.

Diastatic Ferment in Egg-Albumen. Prof. Selmi. (*Ber. der deutsch. chem. Ges.*, 1882, 386.) If egg-albumen is mixed with three volumes of water, and then with a sufficient quantity of alcohol to precipitate the albumen, a substance remains in solution which can transform starch into sugar in aqueous solution.

Artificial diastase—that is, a mixture of albumen bodies and phosphates (which mixture is capable of converting soluble starch into sugar)—is produced if the albumen, precipitated as above directed, is several times washed with water on the filter, then boiled with a dilute solution of acid sodium phosphate, and the whole filtered, The resulting filtrate converts three times as much soluble starch into sugar as a pure solution of acid sodium phosphate.

Constitution of Albuminoids. A. Danilewsky. (*Chem. Centr.*, 1881, 503–504. From *Journ. Chem. Soc.*) By the action of alkalies and pancreatin on albumen, several intermediate bodies are formed, the final product being always peptone. β-albumen is first produced,—a body insoluble in water and warm alcohol, of weak acid reaction, and containing sulphur extractible by alkaline hydroxides, —together with calcium and phosphorus. The bodies next formed belong to the protalbin group, and are more soluble in water and warm alcohol, more strongly acid, and free from calcium and phosphorus; their solutions give coloured residues when evaporated to dryness, and some of them lose their sulphur when heated with soda solution. Finally, we have the peptones, which combine with bases and acids, and yield no sulphides with alkalies. By the action of acids on pepsin, β-albumen is first formed, and then *syntonid*, a member of the albumen group, which neutralizes acids, yields sulphur to alkaline hydroxides, and is insoluble in water; next in order comes the syntoprotalbin group, the members of which coagulate in the cold with acids; and finally the peptones. Tropæolin was used as an indicator in testing the reactions of the various bodies as they were formed, and hydrochloric acid and platinic chloride, which formed compounds rich in chlorine and platinum with basic bodies, and rich in platinum only with acid products. Both series of compounds can be formed from all kinds of albumen. So-called acid albumens are analogues of syntonid, and albuminates consist of various mixtures of natural albumens

and protalbin bodies, which have been built up by the action of alkalies or ferments, and have the same characters as milk caseïn.

Crystallized Vegetable Casein. M. Gruebler. (*Journ. für pract. Chem.*, xxiii., 97. From *Pharm. Journ.*) The author gives an interesting account of crystallized vegetable caseïn formed by the splitting up of aleurone grains by the action of water. It has previously been shown, by Ritthausen, that the crystals of this substance furnished by different plants were not identical. The author finds that the best process for obtaining these crystals is to isolate the aleurone grains by means of fatty oils or petroleum by the method of Maschke, to mix the aleurone with a little water, and after having heated it to 40° C., to filter while hot, and subsequently cool the liquid to 6° or 8°; the albumen is deposited in microscopical crystals. The author finds that the crystals furnished by the pumpkin seed are octahedral, and differ from those of castor oil seed and Brazil nuts in being insoluble in iodized solution of iodide of potassium.

Peptones and Alkaloids. C. Tanret. (*Comptes Rendus*, xcii, 1163–1165. From *Journ. Chem. Soc.*) Solutions of peptone, obtained either by means of pancreatin or pepsin, give, with the ordinary reagents for the alkaloids, precipitates similar to those given by the alkaloids, but these precipitates are soluble in an excess of peptone, whereas the precipitates given by alkaloids are not soluble in excess of the latter. Coagulated white of egg dissolved in sodium hydroxide solution, after neutralisation of the free base and filtration, yields a solution which gives all the reactions of the peptones. This modified albumen, like peptone, is not precipitated by lime; peptone, moreover, is somewhat soluble in alcohol. Other albuminoids will probably behave in the same way. It follows, therefore, that a precipitate by potassium mercury iodide, in presence of free acid, by Bouchardat's reagent, bromine water, and tannin, in a solution previously treated with lime or alcohol to remove albuminoids, cannot be regarded as positive proof of the presence of an alkaloid.

When peptone is treated with potassium carbonate, or better, potassium hydroxide, and agitated with ether, the latter dissolves a small quantity of the substance having all the characters of an alkaloid. If the peptone is allowed to putrefy without becoming alkaline, a solid non-volatile alkaloid is formed. The hydrochlorides of both these alkaloids may be obtained crystallized. From salts of these alkaloids alkaline bicarbonates set free the bases, but the action of the bicarbonates on peptone does not give rise to

alkaloids. It follows, therefore, that the latter do not exist ready formed in the peptone, but are the products of the action of the alkalies.

The alkaloids derived from peptone give Brouardel and Boutmy's reaction, but like the ptomaines, not instantaneously. Eserine, liquid hyoscyamine, and amorphous aconitine and ergotinine, give the reaction instantaneously; with digitaline and crystalline aconitine and ergotinine it is apparent only after a few seconds. This reaction cannot, therefore, be employed to distinguish between animal and vegetable alkaloids.

Estimation of Peptones. T. Defresne. (*Repert. de Pharm.*, ix., 262.) The author criticises the methods in general use, showing them to be more or less liable to error, and urges the advisability of preceding the estimation by a preliminary qualitative analysis. Should the latter reveal the presence of gelatin, as would be indicated by the separation of a viscous mass upon hot saturation of the peptone with magnesium sulphate, recourse must be had to the determination of the total nitrogen and of the nitrogen contained in the gelatin. The difference between the two multiplied by 6·05 will give the weight of dry and pure peptone. If gelatin be absent but glucose present, which is shown by the reddish brown coloration produced by the addition of iodine solution to the diluted peptone, the alcohol process is likewise inadmissible, and in this case, too, the peptone should be estimated by determining the nitrogen. If neither gelatin nor glucose are present, 10 grams of peptone are shaken with 100 grams of absolute alcohol, and 50 grams of ether added to the mixture; after standing for three hours, the precipitate is collected, dried at 100° C., and weighed. By calculating the weight found in 100 grams of solution and adding 5, the weight of dry peptone is obtained. The presence of either alcohol or glycerin in the peptone would not introduce any error into this process.

If it be desired to determine and separate the glycerin, the peptonic solution is evaporated at 90° C. in a flat capsule, until the weight remains constant; the residue is then treated with four parts of alcohol and one part of ether immediately added; the ether-alcohol is filtered off, and by careful evaporation leaves the glycerin nearly pure. The capsule is returned to the stove and afterwards weighed; the difference in weight represents the quantity of glycerin removed by the alcohol.

The estimation of the ash is not worth notice, for it is usually falsified by the enormous proportion of chloride of sodium present.

Influence of the Continued Use of Sodium Carbonate on the Composition of the Blood. D. Dubelir. (*Monatsh. Chem.*, ii., 295-308.) The author, after citing the results, by no means accordant, deduced by various authors from their observations with reference to this question, gives the results of his own analyses of blood taken from the carotid arteries of dogs, some of which had received definite quantities of sodium carbonate with their food, while others had been kept for an equal number of days on the same food unmixed with sodium carbonate. From the comparison of these analyses he deduces the following conclusions:—

1. The continued use of considerable doses of sodium carbonate is attended with a small but perceptible augmentation of the alkalinity of the blood-ash, which increases in strength with the daily quantity of soda added, and the time during which this addition is continued.

2. Potash in the blood-ash is not replaced by soda.

3. Soda does not accumulate in the blood.

4. The proportion of iron, as formerly observed by Nassi, is not diminished by the use of sodium carbonate.

5. The proportion of solid constituents and of nitrogen (albumen) in the blood is not altered by the internal use of sodium carbonate to such a degree as to overstep the normal limits; these, however, have been found to be very variable, *e.g.*, 17·6 per cent. according to Collard de Martigny; 22·2 per cent. according to Forster.

The Reaction of Diabetic Urine with Ferric Chloride. A. Deichmüller. (*Liebig's Annalen*, ccix., 22-30.) B. Tollens. (*Ibid.*, 30-38.) It has been noticed that urine from patients suffering from the more intense forms of diabetes, gives violet reaction with ferric chloride; and by the distillation of these urines alcohol and acetone are obtained. These phenomena are generally attributed to the presence of ethyl acetoacetate, which would yield equal numbers of molecules of acetone (52) and alcohol (46). Owing to the greater volatility of the acetone, the proportion of alcohol might even exceed that of the acetone; but in all cases hitherto examined the reverse has always been most marked. A. Deichmüller has examined the urine of a youth of sixteen suffering from diabetes, which was afterwards complicated with typhus, resulting in death. The urine was acidified and distilled until the distillate gave no reaction with iodine and potassium hydroxide. Potassium carbonate separated from it an oily layer which, after suitable purification, boiled at 56°, and gave the characteristic reactions of acetone. But no alcohol was obtained from 40 litres, even when the patient was taking daily 100 grams of wine containing 15 per cent. alcohol.

The author made a series of determinations of the amount of acetone in the urine, by mixing the distillate with soda and a solution of iodine in potassium iodide in the cold, and filtering off and finally weighing the iodoform obtained. The exactness of the determination depends on the fact that alcohol in dilute solutions gives hardly a trace of iodoform, while acetone is converted into it at once. The percentage of acetone in the urine varied from ·093 to ·147. Inasmuch as the violet reaction with ferric chloride points to the presence of a compound allied to ethyl acetoacetate, and no alcohol was separate from the distillates, it appears that the compound in question is not *ethyl acetoacetate,* but free *acetoacetic acid.*

B. Tollens has examined the question whether the compound in urine which gives the violet colour with ferric chloride can be extracted by ether. The patient was a labourer thirty-six years old. On shaking up the urine, which was strongly acid, with ether, only a very slight trace of the ferric chloride reaction was observable in the extract. But on acidifying the residue with sulphuric acid and repeating the process, the reaction in the ethereal extract was most marked. On slowly distilling another portion of the urine in presence of hydrochloric acid, the distillates gave the iodoform reactions, whilst the residue, even to the end of the distillation, showed the ferric chloride coloration. Similar results were obtained in the case of a woman of sixty suffering from diabetes and mortification of the thigh, and it was further observed that on distillation of the urine, the first few drops which passed over gave a very slight coloration with ferric chloride, but a well-marked iodoform reaction. From these results, the author arrives at the conclusion that the substance present in the urine is not ethyl acetoacetate, which would, as a neutral body, be taken up by the ether from the non-acidified urine, but the substance must be of an acid nature, and is probably free *acetoacetic acid.* For comparison, the author shows that ethyl acetoacetate can be extracted by ether from neutral or acid, but not from alkaline, aqueous solutions. Again, from normal, neutral, or acidified urine, to which one-tenth of its volume of a $1\frac{1}{2}$ per cent. aqueous ethyl acetoacetate solution was added, the ethereal salt could be extracted by the ether; and the same result was obtained even when the urine was rendered alkaline by the addition of hydrodisodic phosphate. Ethyl acetoacetate may be partially separated from such a mixture with urine as that described above, not only by shaking up ether, but also by distillation.

Influence of Muscular Work on the Elimination of Sugar and Urea in Diabetes. H. Oppenheim. (*Pflüger's Archiv*, xxvi., 259.) The author's experiments tend to show that while muscular work increases the secretion of urea, it does not sensibly affect the elimination of sugar.

Sensitiveness of Trommer's and Fehling's Tests for Sugar. W. Müller and J. Hagen. (*Pflüger's Archiv*, xxv., 374.) Trommer's test is found by the authors to be much more delicate at 60° C. than at an ordinary temperature, and more so still at the boiling point. Freshly prepared Fehling's solution exceeds Trommer's test in delicacy.

The lower the temperature at which the test is performed, the greater must be the proportion of alkali, in order to attain the greater sensitiveness in the indication of Trommer's test.

Detection of Albumen in Urine. A. Raabi. (*Chem. Centr.*, 1881, 709.) The author recommends trichloracetic acid for the detection of albumen in urine. A small quantity of the crystallized acid is added to the filtered urine, and the mixture allowed to stand. The acid thus forms a solution on the lower stratum, above which a well-defined cloudy ring is observed if albumen be present. This turbidity does not disappear on warming, while that due to urates does. The latter turbidity, moreover, extends more or less through the whole liquid, instead of forming a well-defined ring.

Estimation of Iodine in Urine. Dr. G. Vulpius. (*Pharm. Zeitung*, 1882, 78.) The process described is a colorimetric one, consisting in the liberation of the iodine, shaking the solution with carbon bisulphide, and comparison of the colour of the latter with that of similar solutions of known strength. The results are satisfactory.

The Detection of Blood-stains. Prof. Dragendorff. (*Pharm. Journ.*, 3rd series, xii., 586; and *Journ. Chem. Soc.*, 1882, 561.) This is a description of methods of manipulation to be adopted in the detection of blood-stains.

The particles of dried blood are first removed, and the scraped spot is used in the following tests:—

(*a*) A small piece of moistened filter-paper is pressed on the spot for from 5 to 30 minutes; then moistened with oil of turpentine, which has been exposed to the air, and a drop of a fresh tincture of guaiacum. The blue colour should appear in a few minutes.

(*b*) A portion of the spot is treated with a few c.c. of a cold saturated borax solution at 40° C., and examined spectroscopically. Oxyhæmoglobin, which it is argued may be confounded in this

test with red inks from cochineal, a colouring matter from the feathers of the banana-eater, and purpurinsulphonic acid, since they yield similar spectra, may easily be distinguished from the first, which is decolorized by chlorine-water without yielding a precipitate, and from the second as it does not yield the spectrum of reduced hæmoglobin when treated with sodium sulphide (1 in 5); purpurinsulphonic acid yields a spectrum only when the solution is hot.

(*c*) The guaiacum test is applied to the solution in borax if the spectroscopic test succeeds.

(*d*) A portion of the solution is diluted with 5 to 6 volumes of water, and precipitated with zinc acetate solution (5 per cent.). The precipitate is washed, dissolved in 1–2 c.c. glacial acetic acid, and examined spectroscopically for hæmatin.

(*e*) A small quantity of the precipitate from (*d*) dissolved in acetic acid is treated on a slide with a crystal of sodium chloride, allowed to dry by exposure to the atmosphere, and examined for hæmatin crystals.

(*f*) A portion of the dried blood which has been scraped from the spots is next tested as in (*e*), and then the guaiacum test applied. The substance may also be tested for nitrogen; but ferric oxide, which absorbs ammonia, as well as wool, silk, etc., may here be sources of error. Blood may be detected on rusty iron by digestion with borax solution at 80°, and spectroscopic examination for hæmatin after warming the solution with acetic acid.

(*g*) The source of the blood may be determined, if fresh, by the size and shape of the corpuscles, but in partially decomposed or dried blood the results are unreliable. Thin fragments may, however, be examined by soaking it in turpentine or some other liquid which does not act on the corpuscles. After removing the hæmoglobin, the residue is treated with iodine for the detection of fibrin. Hairs, fish-scales, etc., often indicate the origin of the blood, and the blood of some animals when warmed with dilute sulphuric acid, often evolves the odour peculiar to the animal, especially so in the case of fish, pig's, and cat's blood. Epithelium cells and sarcinia frequently denote blood from the stomach, whilst that from abscesses contains fat, pus-corpuscles, and cholesterin; in cases of violent defloration or stupration, epithelium cells and spermatozoa should be searched for.

The older the stain is, the more difficult is it to extract the hæmoglobin. A solution of arsenious acid dissolves a spot one or two days old in about a quarter of an hour; eight days' old, in half

an hour; two to four weeks, in one to two hours; four to six months, in three to four hours; a year old, in eight hours.

Borax solution may be used to extract blood from soils; and in the case of blood diluted with water it may be precipitated with zinc acetate, when 1 part in 6000 of water or in 1000 of urine may be detected.

Detection of Chloroform in Cases of Poisoning. Dr. D. Vitali. (*Giorn. Farmac. Chem.*, xxx., 529, and *Amer. Journ. Pharm.*, 1882, 158.) The author places the liquid, which has been distilled from the intestines, in a three-necked flask, and conducts a current of hydrogen through it. The hydrogen, which escapes through a glass tube provided with a platinum point, is then ignited. If chloroform is present in the liquid, it will be carried along with the hydrogen, and burn with the formation of hydrochloric acid. If a piece of fine copper wire be now held in the flame, the latter, in consequence of the formation of cupric chloride, will assume an intense green colour. A small, scarcely visible drop of chloroform, when mixed with 30 c.c. of water, will produce the green coloration very perceptibly.

Estimation of Ergot in Bread and Flour. Dr. Pöhl. (*Pharm. Zeitschr. für Russl.*, No. 20, 933.) The author communicates the following ready method for the quantitative estimation of ergot in rye flour and bread: 15 grams of the flour or well-dried bread are digested with 30 c.c. of ether, to which 15 drops of dilute sulphuric acid (1 in 5) have been added. The ethereal solution is filtered, the flour washed upon the filter with ether, until 30 c.c. of filtrate are obtained, and to the latter 20 c.c. of a cold saturated solution of sodium bicarbonate are then added, whereby the reddish-violet colouring matter of the ergot passes into the aqueous solution, which may be removed by means of a separating funnel. For the comparative colorimetric estimation two artificial mixtures of flour and ergot are prepared, one of 5 per cent. and the other of 1 per cent., which are then subjected to the same treatment.

A New Method of Detecting Mineral Acids in Vinegar. Dr. A. Jorissen. (*Journ. de Pharm. D'Anvers*, 1881, 233.) The author avails himself of the colour reaction between gurjun oil and mineral acids for the detection of these acids as adulterants in vinegar. The test is performed as follows:—

To a mixture of one drop of gurjun oil and twenty-five drops of glacial acetic acid, one drop of the vinegar is added, and after agitation four to six drops ordinary acetic acid; no reaction takes place if the vinegar be free from mineral acids, but when these are

present, a violet coloration is produced which does not disappear on the addition of an equal volume of alcohol. A mixture of nine parts of pure vinegar and one part of standard normal sulphuric acid produced the violet colour in seven minutes, and this did not disappear on the addition of thirty drops of alcohol.

The presence of a large proportion of sodium chloride in vinegar might cause a faint coloration even in the absence of mineral acids; but this coloration would form more slowly, and would disappear on the addition of thirty drops of alcohol.

Examination of Beer for Foreign Bitter Principles. Prof. Dragendorff. (*Chem. Centr.*, 1881, 285–288 and 299–303. From *Journ. Chem. Soc.*) The following method is based on experiments made by the author in conjunction with Kubicki, Jundzill, and Meyke. About 2 litres of the beer to be examined are evaporated on a water-bath until the greater part of the carbonic anhydride and about one-half of the water has been volatilised. The hot liquid is treated with basic lead acetate until no further precipitate is produced. The liquid is filtered as rapidly as possible, and the excess of lead in the filtrate removed with sulphuric acid. The filtrate is neutralised with ammonia to a faint acid reaction, evaporated to 250 to 300 c.c., mixed with four parts by volume of absolute alcohol, and allowed to stand for twenty-four hours. The alcohol is then driven off by distillation, and a portion of the residue shaken up successively with light petroleum, benzene, and chloroform, and another portion is treated in a similar manner, having previously been rendered neutral with ammonia. Pure beer, prepared from malt and hops, exhibits the following reaction:—Light petroleum absorbs only a small quantity of solids and liquids contained in the beer. The solids have no bitter taste, and give a yellow colour with sulphuric acid. Benzene and chloroform give the same reactions. Similar results are obtained by treating the ammoniacal solution with these solvents. Beer wort behaves like fermented beer.

According to the above method, the following hop surrogates added to beer can be detected:—

1. *Wormwood.* With light petroleum, the acid solution gives an oil of peculiar odour, containing a portion of the bitter principle. By evaporating the extract and treating the residue with sulphuric acid, a brown solution is obtained, which gives the reactions characteristic of absinthin. Similar results are obtained with benzene and chloroform.

2. *Ledum palustre* gives an ethereal oil having the penetrating

odour of the plant. Benzene and chloroform extract bitter principles.

3. *Menyanthes trifoliata* (Buckbean). Petroleum extracts but traces of the bitter principle; benzene, however, and especially chloroform, take up larger quantities. The bitter principle (menyanthin) is recognised by its taste and the characteristic odour it produces when treated with dilute sulphuric acid.

4. *Quassia*, like the preceding, is absorbed from its solutions by benzene and chloroform, petroleum extracting only traces.

5. *Colchicum*. Light petroleum remains inactive, benzene absorbs small quantities of colchicin and colchiceïn.

6. *Cocculus indicus*. Petroleum and benzene are inactive. Chloroform, or better, amyl alcohol, extract the bitter principle picrotoxin.

7. *Colocynthin*. Chloroform extracts large quantities.

8. *Willow bark*. Salicin is taken up freely by amyl alcohol.

9. *Strychnine* can be extracted only from ammoniacal solutions, benzene and chloroform being the best solvents.

10. *Atropine* and

11. *Hyoscyamine* are extracted from ammoniacal solutions by benzene and chloroform. Certain bitter principles of *Capsicum annuum*, *Daphne Mozereum*, *Cnicus benedictus* and *Erythraca Centaureum* are extracted by benzene and chloroform from acid solutions.

12. *Aloes*.—In order to extract this, the above method requires modification. The beer is treated with acetate of lead, and shaken up with amyl alcohol. The residue on evaporation has the characteristic taste and properties of aloes.

13. *Gentian*.—This also requires a modification of the method. After precipitating with normal lead acetate, as in the above, the mixture is filtered, and the filtrate treated with sulphuric acid to separate the excess of lead. The solution is evaporated, and the residue acidified with nitric acid and subjected to dialysis. The neutralized solution is again treated with normal acetate of lead, filtered, and the filtrate treated with basic lead acetate and ammonia. This precipitates gentianin, which can be isolated from its solution in sulphuric acid by benzene or chloroform.

14. *Picric acid* is not wholly precipitated by basic lead acetate, and cannot be extracted with safety by the above-named solvents. Brunner proposes to digest wool for twenty-four hours in the beer previously acidified by hydrochloric acid. The wool is subsequently washed, and the picric acid extracted with ammonia.

Detection of Logwood Colouring in Wine. A. Pezzi. (*Gazz. Chim. Ital.*, xi., 120.) 20 c.c. of the wine to be tested are agitated for some time with 2 grams of finely powdered manganese dioxide, then filtered, and treated with zinc and hydrochloric acid in order to reduce any hæmatein present to hæmatoxylin. The resulting liquid is then tested for hæmatoxylin by the various reagents for that substance.

Estimation of Starch as an Adulterant in Pressed Yeast. M. Haydock. (*Bied. Centr.*, 1881, 343.) Unadulterated pressed yeast contains on an average 74 per cent. water. In samples adulterated with starch the proportion of pure yeast present may be calculated from the percentage of water found by means of the following formula:—

$$x = 2{\cdot}63\,b - 9{\cdot}47,$$

where x represents the proportion of pure yeast, and b the amount of water contained in 10 grams of the adulterated sample.

Estimation of Starch as an Adulterant in Pressed Yeast. E. Geissler. (*Chem. Centr.*, 1881, 158.) 3 or 4 grams of the sample are suspended in water and heated with a few drops of hydrochloric acid until iodine no longer strikes blue with a drop of the liquid. The coagulated yeast is washed by decantation, then transferred to a tared filter, dried, and weighed.

A New Reaction of Milk. C. Arnold. (*Archiv der Pharm.* [3], xix., 41.) Tincture of guaiacum, when added to fresh milk, produces an intense blue coloration, which the author attributes to the presence of ozone in the milk. Boiled milk fails to give the reaction.

Delicate Test for Ammonia Gas. G. Krouper. (*Pharm. Post*, 1882, No. 2.) If fuchsine is dissolved in water, and diluted sulphuric acid be added to the solution, its red colour changes to yellowish brown. Strips of unsized paper dipped in this solution, which should not be too dilute, assume after drying a handsome yellow colour, resembling turmeric paper.

Gaseous ammonia coming in contract with this paper imparts to the latter a lasting carmine tint. This test-paper is useful for detecting traces of ammonia. The substance suspected to contain it is mixed with slaked lime in a beaker or test-tube, moistened with a little water, and a strip of the test-paper suspended in the upper portion, the vessel being stoppered or covered. The paper is best used in a dry condition, since it acquires a bluish tint when moistened, and the transition of this tint to red is not easily noticed. Decomposition of the ammoniacal salts may be hastened by warming the vessel; vapour of water does not colour the paper.

When exposed to the air, the test-paper is gradually affected by the moisture contained in it. It should, therefore, be kept in well-stoppered bottles. But even then it does not keep for a long time, and had better be renewed occasionally.

Separation and Estimation of Nitric and Nitrous Acids. A. Piccini. (*Gazz. Chim. Ital.*, 1881, 267–274.) The author has already suggested an easy method of detecting small quantities of nitric acid in presence of excess of nitrous acid, founded on the different reactions of these acids with urea; and he now finds that normal ferrous salts may be used for the same purpose, inasmuch as they turn brown on addition of a nitrite, especially when heated, and in concentrated solution, or in a solution acidulated with acetic acid; whereas they exhibit no such reaction with nitrates. If, therefore, a neutral ferrous solution be placed in contact with a mixture of nitrates and nitrites and heated, the nitrite will be decomposed, with evolution of nitrogen dioxide, which will colour the liquid brown, while the nitrate will remain unaltered until a strong acid is added, which liberates the nitric acid and exposes it to the reducing action of the ferrous salt. If the decomposition of the nitrite under these circumstances is complete, and takes place in the manner above indicated, the quantity of gas evolved while the solution remains neutral, will afford a measure of the amount of nitrous acid present; and that which is given off after the acidulation of the liquid will give the measure of the nitric acid.

In applying these reactions to analytical purposes, the author finds that ferrous chloride is preferable to the sulphate, as it acts more rapidly, and being also more soluble than the sulphate, it enables the operation to be carried on with smaller quantities of liquid. To obtain a perfectly neutral solution of ferrous chloride, iron filings are digested first at ordinary then at a higher temperature, with hydrochloric acid of sp. gr. 1·12 in a flask filled with carbonic acid, and when the iron is no longer attacked, an excess of moist, thoroughly washed ferrous oxide is added, and the liquid is boiled and afterwards left to cool in the atmosphere of carbonic anhydride; a few drops of pure dilute soda solution are then added, whereby a precipate is formed, and the liquid, after agitation, is filtered, also in carbonic acid gas. In this manner a deep green solution of neutral ferrous chloride is obtained, which may be preserved in an apparatus similar to that used by Fresenius for keeping stannous chloride.

For the description of the apparatus employed, and the details of the analytical operations, we must refer to the original paper; the results are very exact.

Determination of Nitric and Nitrous Acids as Ammonia. A. Guyard. (*Comptes Rendus*, April 3, 1882; *Chemical News*, xlv., 174.) The author's method is based on the fact, that in presence of marsh-gas and soda-lime at a red heat, the nitrogen oxides, whether free or combined with alkalies, or the nitric oxides of organic matters, are totally converted into ammonia. The manipulations are identical in all points with those required by the processes of Peligot, Will, and Varentrapp. The author mixes intimately 5 grams of sodium acetate previously dried, and 45 grams of soda-lime. Of this mixture 10 to 15 grams are introduced at the bottom of the combustion-tube; this portion is intended to sweep out the ammoniacal gas by means of a current of marsh-gas. With the 35 to 40 grams of the mixture remaining, there is mixed 0·4 to 0·5 grams of the nitrous compound. The whole is introduced into the tube, which is then filled up with ordinary soda-lime, and the combustion is carried out as in an ordinary determination of ammonia. This process gives the whole of the nitrogen existing in different forms as ammonia. To determine in a sample the nitrogen in its three principal forms, three determinations are needed:—1. Determination of ammoniacal nitrogen with soda-lime and calcium oxalate. 2. Determination of total nitrogen by the process above described; the difference gives the nitrogen present in nitric acid. 3. Determination of total nitrogen in a portion of the sample previously freed from nitrous acid by evaporation in the water-bath with an excess of acetic acid.

The difference between No. 1 and No. 3 shows the nitrogen present as nitrous acid.

Purification of Carbon Bisulphide. P. Palmieri. (*Zeitschr. für Analyt. Chemie*, 1882, xxi., 254.) The author recommends the addition of 2 to 3 parts of anhydrous copper sulphate to 100 parts of the bisulphide of carbon, and subsequent agitation of the mixture. When the copper sulphate, which becomes perfectly black, is deposited, and the odour of sulphuretted hydrogen is no longer perceptible, the liquid is filtered or decanted. Absolute purity is obtained when the carbon bisulphide is again rectified over anhydrous copper sulphate. In order to maintain the carbon bisulphide—which in this manner is said to lose all disagreeable odour—permanently pure, it may be allowed to remain in contact with a little anhydrous copper sulphate. The employed copper sulphate may be made available for further use in purification by ignition, treatment with sulphuric acid, and subsequently again igniting.

Purification of Carbon Bisulphide. E. Allary. (*Bull. de la Soc. Chim.*, xxxv., 492.) The author suggests that the carbon bisulphide to be purified should be covered with a layer of water, and than a solution of potassium permanganate gradually added, under continual agitation, until the aqueous layer remains perfectly red. The product is than washed with water, and finally separated in a separating funnel. In most cases a further purification by rectification is not necessary.

New Reagent for Sulphur and Nitrobenzol. R. Brunner. (*Zeitschr. für analyt. Chem.*, 1881, 390.) The substance to be tested for sulphur is mixed with some strong solution of potash, then a few drops each of commercial nitrobenzol and alcohol, and the mixture allowed to stand at an ordinary temperature, with occasional shaking. If sulphur or alkaline sulphides were present, a reddish colour, due to the reduction of the nitrobenzol will appear after some time. By this method, not only the presence of free sulphur, but also that organically combined in albumen, bread, wool, etc., may be demonstrated directly.

By inverting the process, and adding pure sulphur instead of nitrobenzol, the presence of the latter may be shown. Nitrobenzol may be thus detected as an adulterant in oil of bitter almonds.

Preparation and Application of Hydrobromic Acid. A. Harding. (*Ber. der deutsch. chem. Ges.*, xiv., 2085.) The author describes an apparatus for the synthetical preparation of hydrobromic acid. The hydrogen and bromine, the former in slight excess, are passed together through a glass tube (1 m. long, 7 mm. diameter), surrounded by another glass tube through which a current of steam circulates, and thence into a platinum tube (14 cm. long and 12 mm. diameter), containing a platinum spiral coil heated to redness. The hydrobromic acid thus formed is collected in water in thin flasks, cooled by a stream of water; any free bromine is removed from the escaping gas by passing it over a tube filled with antimony. With tubes of the above dimensions, 1 kilo. of concentrated hydrobromic acid can be made in an hour. The organic matter present in commercial bromine may be conveniently removed by sending the bromine vapour over red-hot manganic oxide.

Hydrobromic acid dissolves all simple sulphides, both natural and artificial, with evolution of sulphuretted hydrogen. The author recommends a method for estimating sulphur either in sulphides or free sulphur, by means of hydrobromic acid. The apparatus employed is fully described, into which the substance is introduced along with small pieces of amalgamated copper wire and some

mercury, the air being expelled by a current of hydrogen, and hydrobromic acid run in. The tube is then carefully warmed until all the substance is dissolved, when more hydrobromic acid is introduced, and the whole well boiled to drive off the hydrogen sulphide, the last traces being removed by a current of hydrogen. The loss in weight is the hydrogen sulphide evolved. This method is based on the fact that the sulphur in a metallic sulphide or in free sulphur is completely converted into hydrogen sulphide when these subjects are treated with hydrobromic acid in presence of amalgamated copper. Several results are given, which agree very well with one another. Each estimation takes from $1\frac{1}{2}$ to 2 hours. Hydrobromic acid dissolves mercury, copper, and lead with evolution of hydrogen.

Relative Strengths of Solutions of Hydrobromic Acid, and their Specific Gravities. Dr. Biel. (*Pharmaceut. Zeitschr. für Russland*, Jan. 3, 1882.) The author has made a fresh series of determinations of the specific gravity, at 15° C., of solutions containing from 1 to 50 per cent. of anhydrous hydrobromic acid, and summarises his results in the following table :—

1	per cent.	1·0082	18	per cent.	1·145	35	per cent.	1·314
2	,,	1·0155	19	,,	1·154	36	,,	1·326
3	,,	1·0230	20	,,	1·163	37	,,	1·338
4	,,	1·0305	21	,,	1·172	38	,,	1·350
5	,,	1·038	22	,,	1·181	39	,,	1·362
6	,,	1·046	23	,,	1·190	40	,,	1·375
7	,,	1·053	24	,,	1·200	41	,,	1·388
8	,,	1·061	25	,,	1·209	42	,,	1·401
9	,,	1·069	26	,,	1·219	43	,,	1·415
10	,,	1·077	27	,,	1·229	44	,,	1·429
11	,,	1·085	28	,,	1·239	45	,,	1·444
12	,,	1·093	29	,,	1·249	46	,,	1·459
13	,,	1·102	30	,,	1·260	47	,,	1·474
14	,,	1·110	31	,,	1·270	48	,,	1·490
15	,,	1·119	32	,,	1·281	49	,,	1·496
16	,,	1·127	33	,,	1·292	50	,,	1·513
17	,,	1·136	34	,,	1·303			

Magnesium Carbonates. H. Beckurts. (*Archiv der Pharm.* [3], xviii., 429-442, and [3], xix., 13-23; *Journ. Chem. Soc.*, 1882, 13.) Pattinson (*Chem. News*, 1863, 128) described a process for preparing the officinal carbonate of magnesia, consisting in treating slightly ignited dolomite with carbonic anhydride and water under 5–6 atmospheres pressure, when it is found that so long as any magnesium carbonate remains undissolved, so long will the calcium car-

bonate remain unacted on, the solution in the carbonic anhydride and water being of acid magnesium carbonate only. When this solution is heated with steam, carbonate of magnesia is precipitated as a bulky powder. The author confirms the statement that unignited dolomite yields no solution of magnesium carbonate when treated with carbonic anhydride under pressure, from which he concludes that in dolomite we have a double carbonate of calcium and magnesium, which, on igniting, splits up partially into carbonic anhydride, and into the separated carbonates of the bases.

The purity of the carbonic anhydride, in addition to that of the dolomite and the water, is not without influence on the product. At the Nauheim factory a very pure gas, which escapes from the ground in the neighbourhood, is employed.

On triturating the officinal carbonate of magnesia with water, and passing carbonic anhydride through the liquid, a solution is obtained which, on spontaneous evaporation, yields a neutral magnesium carbonate with 3 mols. of water of crystallization, of sp. gr. 1·875. The author finds that 658 parts of water at 19° dissolve 1 part of this salt. Neutral magnesium carbonate is also obtained by the double decomposition of a soluble magnesium salt with sodium carbonate.

The author found the ratio of magnesium oxide to carbonic anhydride in solutions of magnesium carbonate in water containing this gas, to be approximately 1 in 2 (in equivalents), whence he concludes that such solutions contain the salt $Mg\,(H\,C\,O_3)_2$.

On heating a litre of a 3·71 per cent. magnesium carbonate solution for about five minutes at 70–75°, an abundant evolution of carbonic anhydride occurs, and crystals of neutral magnesium carbonate separate. The filtrate, containing 1·2 per cent. of magnesium carbonate, heated to 71° for five minutes, again evolves gas, but deposits an appreciably smaller amount of neutral carbonate. On boiling the filtrate from this, a few decigrams of a basic carbonate were deposited, containing 42·7 per cent. of magnesium oxide. The author further found, on boiling a solution of magnesium carbonate in carbonic anhydride, that he always obtained the same basic salt, the concentration of the solution and the duration of the boiling have no influence on its composition. From analyses of this basic body, and the composition of carbonate of magnesia from various sources, the author deduces for the latter compound the formula, $5\,Mg\,C\,O_3,\ 2\,Mg\,(O\,H)_2 + 7\,H_2\,O$, which requires 42·4 $Mg\,O$, 34·2 $C\,O_2$, and 22·4 $H_2\,O$.

H. Rose (*Ann. Chem. Pharm.*, lxxx., 231) invested more minutely

the precipitates produced by alkaline carbonates with magnesium salts, and deduced the formulæ,—

$$4\,Mg\,CO_3 + Mg\,(OH)_2 + 4\,H_2O,$$
$$4\,Mg\,CO_3 + Mg\,(OH)_2 + 5\,H_2O,$$
$$3\,Mg\,CO_3 + Mg\,(OH)_2 + 4\,H_2O.$$

The author also in two cases found commercial products of the composition of the last formula. On boiling the neutral air-dried carbonate with much water, a salt, $3\,Mg\,CO_3$, $Mg\,(OH)_2 + 5\,H\,O$, as above was obtained.

Kraut (*Archiv der Pharm.*, ccxvii., 252) has published analyses of magnesium products more or less agreeing with those of the author.

The heavy carbonate of magnesia of the Pharmacopœia is obtained by double decomposition of magnesium sulphate and sodium carbonate, evaporation of the mixture, washing with hot water, and drying at 100°. Its composition is $3\,Mg\,CO_3$, $Mg\,O + 5\,H_2O$. Corresponding to the two varieties of carbonate of magnesia of the British Pharmacopœia are a heavy and light calcined magnesia. The sp. gr. of light calcined magnesia is 2 74; the sp. gr. of heavy calcined magnesia is 3·057; that of calcined magnesia (obtained by ignition of neutral magnesium carbonate) 3·69. With reference to the presence of calcium carbonate in magnesium preparations, the author remarks that a less quantity than 3 per cent. cannot be detected by ammonium carbonate. Oxalic acid does not give appreciably better results. By Biltz's method, $\frac{1}{2}$ per cent. of lime can be detected, but by the Graham-Otto method (Graham-Otto, *Lehrb.*, 4th edit., ii., 614), by igniting and extraction with water, the author has succeeded in detecting 0·01 per cent. of calcium carbonate in carbonate of magnesia.

Solubility of Lead Sulphate in Basic Lead Acetate. Dr. K. Stammer. (*Chemiker Zeitung*, Jan. 26, 1882.) The author points out that lead sulphate is appreciably soluble in a solution of basic lead acetate, but not in the normal acetate. From such a solution the sulphate is reprecipitated by acetic acid.

Combination of Lead Iodide with Alkaline Iodides. A. Ditte. (*Comptes Rendus*, xcii., 1341–1344.) When lead iodide is put into a solution of potassium iodide, it dissolves at first slowly, afterwards more rapidly, until the solution is saturated; after a time the liquid becomes filled with white needles which have only the slightest yellow tinge. These crystals have the composition $Pb\,I_2 . 2\,K\,I . 4\,H_2O$; they are decomposed, with re-formation of lead

iodide, both by addition of water and by raising the temperature of the solution; alcohol produces the same effect.

The study of this decomposition was effected (1) by adding water to a great excess of the double iodide, so as to decompose only a part, and analysing the liquor when the action was complete; (2) by adding potassium iodide by degrees to a mixture of water and lead iodide, until needles of the double salt began to form, and then analysing the liquid in contact with the double iodide. In this way it was possible to ascertain the weight of alkaline iodide which at any given temperature is necessarily present, so as to prevent decomposition of the double salt. These quantities are, per litre of liquid, at 5°, 140 grams; at 10°, 160 grams; at 20°, 204 grams; at 39°, 300 grams; at 59°, 503 grams; at 85°, 738 grams of potassium iodide.

Thus the decomposition of the double iodide of lead and potassium follows the general law, namely, that at all temperatures a liquid in which the double salt is capable of existing without being decomposed, must contain a definite and minimum quantity of alkaline iodide. No reaction takes place when water, lead iodide, and potassium iodide are brought together; if the proportion of the latter is less than that already indicated, a very little lead iodide only dissolves; if the alkaline iodide is in sufficient quantity, the two iodides will combine until there remains in the liquid just sufficient alkaline iodide to prevent the decomposition of the double salt. The same phenomena takes place if sodium or ammonium iodide is substituted for potassium iodide.

Yellow Oxide of Mercury. J. Comere. (*Répert. de Pharm.*, 1881, 109.) The difference in shade of colour of commercial samples of precipitated oxide of mercury induced the author to make some experiments to ascertain the cause of this variation. The Pharmacopœia directs the oxide to be prepared by treating a solution of bichloride of mercury with an excess of caustic soda, carefully washing the precipitate, and drying it at a gentle heat. It is necessary to employ an excess of the alkali, in order to obtain a product free from oxychloride. If the conditions are modified, the following results are obtained:—

On employing solutions of bichloride of mercury and of caustic soda, at the ordinary temperature, the product has a bright yellow colour.

If the solution of bichloride is used at a temperature of 50–60° C., and the solution of soda at an ordinary temperature, the product has an orange colour.

If the mercurial solution is boiling, and the alkaline solution at the ordinary temperature, the product is darker in tint than the preceding.

If both solutions are brought together boiling, the deepest tint is produced.

A darker tint may also be imparted to the bright yellow oxide prepared by cold precipitation, if it be boiled with a large quantity of water. The longer the boiling, the deeper will be the tint.

The Action of Heat on Mercuric Chloride. Dr. Carnelly. (*Pharm. Journ.*; from a paper read before the Chemical Society, Jan. 19, 1882.) About twelve months ago the author exhibited to the society some experiments of the action of heat on ice and mercuric chloride under low pressures, and subsequently read a paper on the subject before the Royal Society. Two propositions were advanced: (1) That when the superincumbent pressure is maintained below a point called "the critical pressure," it is impossible to melt ice, mercuric chloride, and probably other substances, no matter how great the heat applied. (2) That under these circumstances ice and mercuric chloride attain temperatures considerably above their natural melting points without melting. Subsequent observers have confirmed the first proposition, but have been unable to verify the second. The author has, therefore, repeated his previous experiments with mercuric chloride, and, in addition, has made determinations of the temperature of mercuric chloride heated in a vacuum, by dropping the heated solid into calorimeters containing turpentine, benzoin, and petroleum. Some unexpected results were obtained. When the salt is pressed as a compact powder round the bulb of a thermometer, and heated in a vacuum, the thermometer rises 21° to 50° above the melting point of the mercuric chloride, though still surrounded by the solid salt. When the salt is in the form of a solidified cylinder, the temperature rises 15° above the melting point. When a turpentine calorimeter is used, the temperature of the mercuric chloride came out 100° above the ordinary melting point; but with petroleum or benzene, temperatures above the ordinary melting point could not be obtained. The author, therefore, withdraws his previous statement, and concludes that although mercuric chloride does not fuse when heated under diminished pressure, yet its temperature never rises appreciably above its ordinary melting point; the high temperatures indicated by the thermometer being due to the diffusion of the superheated vapours of the mercuric chloride through the pores of the solid salt. The author also concludes that turpentine cannot be used in

a calorimeter for the determination of the specific heat of bodies soluble in water, since some substances, such as mercuric chloride, zinc chloride, etc., when heated cause an evolution of heat, due probably to the polymerization of the turpentine. Hence many of Regnault's specific heat determinations in which turpentine was employed are probably too high; they are, it may be remarked, in almost all cases higher than Kopp's numbers, that observer having used coal-tar naphtha. The specific heat of mercuric chloride is 0·06425, and of zinc chloride 0·14301, neither value being altered by a rise of temperature.

Salicylates of Mercury. MM. Lajoux and Grandval. (*Journ. de Pharm. et de Chim.*, Jan., 1882, 39. From *Pharm. Journ.*) The authors have recently been engaged in the investigation of the salicylates of iron and mercury, and as an instalment of their results they describe four new salts of mercury. The normal mercurous salicylate is obtained by precipitating salicylate of soda in excess with a solution of mercurous nitrate as slightly acid as possible. This compound, which is amorphous, can be washed with boiling water without fear of decomposition; but when it is treated with great excess of ether it splits up into salicylic acid, which dissolves in ether, and neutral mercurous salicylate, insoluble in ether and in water, which when dried at 100° C. is amorphous, and of a greenish grey colour. On the other hand, of the two mercuric salicylates, the neutral salt appears to be the more permanent. It is obtained by the action of salicylic acid on yellow oxide of mercury. It is necessary, however, to use double the theoretic quantity of salicylic acid, since with equal molecules the colour of the yellow oxide is scarcely affected in the presence of boiling water, but it disappears gradually as more acid is added, up to the point of the second molecule. Two layers are formed in the liquid: the upper, which is crystalline, consists of salicylic acid; the lower very dense and amorphous, is the neutral mercuric salicylate. It is insoluble in ether and alcohol, and soluble in solutions of sodium chloride and potassium iodide. The normal mercuric salicylate is obtained as a white amorphous precipitate by treating a dilute solution of normal salicylate of soda in excess with a dilute solution of mercuric nitrate.

Bismuth Subnitrate. C. Schneider. (*Archiv der Pharm.* [3], xviii., 350.) The author has prepared large quantities of bismuth subnitrate free from arsenic by a method based on the observation previously made by R. Schneider, that bismuth arsenate is insoluble in a strong and nearly neutral solution of bismuth nitrate. By

dissolving 1 kilogram of commercially pure bismuth in coarse powder, in small portions at a time, in 5 kilos. of the purest nitric acid free from chlorine (sp. gr. 1·2) at 80°, and cooling on completion of the action, a slight residue of basic salt and traces of metal remained undissolved, which residue was found to be perfectly free from arsenic. On evaporating and decomposing the crystals of normal bismuth nitrate obtained, the basic nitrate was found to be free from arsenic, but the water used for precipitating and washing contained arsenic, showing that arsenic must have been in the solution of the metal, which contained large quantities of pure nitric acid, and must subsequently have been retained by the crystals of the normal salt. Other experiments of a similar nature were made with slight variations, and gave substantially the same results. By operating in a precisely similar manner on 1 kilo. of the same bismuth—after purification by fusion with soda and potassium nitrate—precisely the same results as to arsenic were obtained. One hundred grams of an arsenical-bismuth, in coarse powder, were mixed with 0·5 gram of metallic arsenic, and then added in very small successive portions to 500 grams of nitric acid (sp. gr. 1·2), heated to 80°. The liquid was at once rendered turbid by the separated bismuth arsenate. The insoluble residue was white, weighing 2·3 grams, and was highly arsenical. 125 grams of normal salt were obtained, yielding 59 grams of basic salt. The mother-liquor was free from arsenic, but the basic salt gave very perceptible arsenic mirrors in Marsh's apparatus. 120 grams of the same coarsely powdered metal, with 0·5 gram of metallic arsenic, were acted on exactly as in the previous case, except that the metal was added quickly in small proportions; the highly arsenical insoluble residue weighed 6 grams. 175 grams of normal salt were obtained, yielding 75 grams of basic salt, which, as well as the mother-liquor, was completely free from arsenic.

The Action of Potassium Cyanide on Bismuthous Nitrate. M. M. P. Muir. (*Chemical News*, xliv., 236.) By this action Boedeker obtained a reddish brown salt, to which he gave the formula $Bi_2 O_5 \, 2 H_2 O$. In a previous paper, the author prepared this puce coloured body, and came to the conclusion that it contained no water when dried at 150°, and that its composition was $Bi_2 O_7$. Subsequent and more careful testing of this substance has convinced the author that it contains cyanogen, and that its formula is $Bi_7 (CN)_6 O_{15}$, or, perhaps, $2 Bi (CN)_5 \, 5 Bi_2 O_5$. This bismuth oxycyanide, when dried at 140–150°, is a reddish brown solid, somewhat resembling lead dioxide; it dissolves in hot strong nitric

or sulphuric acid, producing dark-red liquids. The author gives details as to the formation and reactions of this substance. By the action of hot concentrated aqueous solution of potash on the oxy-cyanide, $Bi_4 O_7$ is formed. This compound, which the author designates bismutho-hypobismuthic oxide, is heavy, dark grey, and crystalline; it undergoes no alteration when exposed to air and light; dissolves readily in strong hot nitric acid, forming a purple liquid.

Iodides of Arsenic. D. Bamberger and J. Philipp. (*Ber. der deutsch. chem. Ges.*, xiv., 2643.) The authors find that Nicklès' method of preparing *arsenic tri-iodide* is the most convenient, viz., by heating arsenic and iodine in equivalent proportions in carbon bisulphide. Arsenic tri-iodide is soluble in most ordinary menstrua, but sparingly soluble in hydrochloric acid; it readily takes up oxygen, evolves iodine, and is converted into arsenious oxide (an analogous reaction occurs with sulphur). It is, however, far more stable in aqueous solutions, from which it may be precipitated unchanged. On decomposing a hot hydrochloric acid solution of arsenious acid with a concentrated solution of potassium iodide, the tri-iodide separates out as a golden crystalline powder. If ammonia is passed into a solution of the tri-iodide in ether or benzene, a bulky white precipitate is thrown down, having the composition $2\,As\,I_3,\ 9\,N\,H_3$. The tri-iodide, when heated with alcohol at 150°, yields ethyl iodide.

Arsenic Di-iodide, $As\,I_2$.—The existence of phosphorus di-iodide and dihalogen compounds of bismuth, renders the existence of the corresponding arsenic compound probable; this the authors have succeeded in preparing by heating 1 part arsenic and 2 parts iodine, in sealed tubes, to 230°; a dark cherry-red crystalline mass is obtained, from which the di-iodide is separated by crystallization from carbon bisulphide, in an atmosphere of carbonic anhydride. It is very readily oxidized, both in the solid state and in solution; on the addition of water it turns black, with separation of metallic arsenic, according to the equation $3\,As\,I_2 = 2\,As\,I_3 + As$; this reaction distinguishes the di-iodide from the tri-iodide. It forms thin prismatic crystals of a cherry-red colour, but owing to their becoming opaque on exposure to the air, the measurement of their angles is rendered difficult; one of the angles, however, seems to correspond with one of the angles of the analogous phosphorus compound.

Distribution of Arsenic in the Animal Body. S. W. Johnson and R. H. Chittenden. (*Journ. Chem. Soc.*, Nov., 1881, 1082.) The body of a woman who had died of chronic poisoning

with arsenious acid, was found, after having been buried for a year and a half, to contain 2·8463 grains of As_2O_3, of which 0·4665 grain was contained in the internal organs—stomach, liver, lungs, brain, etc.,—leaving 2·3798 grains for the muscle and bone tissues. These results differ considerably from those obtained by Scolosuboff (*Bull. Soc. Chim.* [2], xxiv., 124), who from experiments upon dogs poisoned slowly with solution of sodium arsenite added to their food, or quickly by subcutaneous injection of the same solution, concluded that the greater part of the arsenic becomes localised in the brain and other parts of the nervous tissue, and therefore that in cases of acute arsenical poisoning the legal expert should search for the arsenic chiefly in the brain. The authors, on the other hand, direct attention to the well-known fact that the form of the poison has a very decided influence on the rapidity of its absorption, and is likely also to modify the rate and amount of its absorption by different tissues; hence, as cases of poisoning by sodium arsenite are not of common occurrence compared with those in which the less soluble white oxide has been used, the deductions drawn from Scolosuboff's experiments are not applicable to the common forms of arsenical poisoning. Experiments on a large dog, to which 6·5 grams of solid As_2O_3 had been given in his meat for eight days, in doses increasing from 0·1 gram to 2·5 grams daily, showed that 100 grams of intestine gave 0·0020 gram of metallic arsenic, 100 grams of liver gave 0·0010 As, 113 grams of kidneys gave 0·00350 As, 100 grams of muscle, 0·0002 As; 150 grams of urine in bladder gave 0·0003 As.; whereas the entire brain yielded only a faint mirror, and 100 grams of blood a distinct mirror.

Similar results have been obtained by E. Ludwig (*Jahresb. für Thierchemie*, 1879, 85), who finds that in human beings, as well as in dogs poisoned by arsenic, and in acute as well as in chronic cases, the liver contains the largest amount of arsenic, and the kidneys in acute cases contain a considerable quantity, whereas the bones and brain in either case contain only small traces.

The Detection of Arsenic by Fresenius' and Babo's Test. W. Fresenius. (*Zeitschr. für Analyt. Chem.*, xx., 522.) In reply to adverse criticism on the above test, the author asserts that the unfavourable results complained of are due, not to any defects in the test itself, but to the so-called improvements and simplifications introduced by the critics themselves. He strongly insists on the necessity of carefully following the directions given by the authors of the method, as described in Prof. R. Fresenius' manual of analyis.

A New Series of Phosphates and Arseniates. E. Filhol and M. Senderens. (*Comptes Rendus*, xciii., 388.) The salts described by the authors contained three molecules of alkaline hydrate for two molecules of P_2O_5 or As_2O_5, and are perfectly neutral to litmus.

Neutralization of Phosphoric Acid by Alkaline Hydrates. A. Joly. (*Comptes Rendus*, xciv., 529.) The author regards litmus as an unsuitable indicator of the point of neutralization of phosphoric acid, and recommends certain azo-colours (Poirrier's Orange, No. 3, and Helianthin) for this purpose. With the use of these indicators it was found that one molecular weight of phosphoric acid (H_3PO_4) is exactly neutralized by one molecular weight of alkaline hydrate. The normal sodium phosphate, Na_2HPO_4, requires the addition of one equivalent of hydrochloric or sulphuric acid for perfect neutralization.

Volumetric Estimation of Phosphoric Acid. E. Perrot. (*Comtes Rendus*, xciii., 495. From *Journ. Chem. Soc.*) Two solutions are prepared, one by dissolving 6·85 grams silver nitrate in a litre of water, and the other by dissolving 5·414 grams pure sodium chloride in two litres of water. The insoluble phosphate is treated with nitric acid of sp. gr. 1·030, and the solution filtered from insoluble matter. The filtrate is then rendered alkaline with ammonia, the precipitated phosphates are filtered off, carefully washed, and then treated with acetic acid, which dissolves only the calcium and magnesium phosphates. The insoluble iron and aluminium phosphates are washed with dilute acetic acid, and ammonia is added to the solution of calcium and magnesium phosphates, until a slight permanent precipitate is formed; this is dissolved by addition of a drop of acetic acid, and 100 c.c. of the silver solution are run in from a pipette. The precipitate of silver phosphate is then allowed to settle, and the excess of silver solution determined by means of the solution of sodium chloride. To estimate soluble phosphates, the mineral is treated with water, without the addition of acid. Retrograde phosphoric acid is dissolved by means of citric acid in the usual way.

Detection of Hydrocyanic Acid in Poisoning Cases. E. Reichardt. (*Archiv der Pharm.* [3], xix., 204.) In a case of poisoning by hydrocyanic acid, the author succeeded in detecting this poison in the organs two months after death. The process adopted consisted in the distillation of the organs with solution of tartaric acid, and testing the distillate both with the guaiacum-copper reaction, and the Prussian blue test. Before applying this method,

the author had satisfied himself of the absence of ferrocyanides, ferricyanides, and thiocyanates.

Estimation of Chloric Acid. M. Becker. (*Ber. der deutsch. chem. Ges.*, 1882, 391.) The author has critically examined the various methods in use for the estimation of this acid, and obtained the best results by the reduction of the chlorate in neutral solution by means of pure ferrous sulphate.

Action of Acids upon Nitrites. A. Vogel. (*Zeitschr. fur Analyt. Chem.*, 1881, 553.) Solutions containing alkaline nitrites, together with potassium iodide and mucilage of starch are turned blue, not only by most inorganic and organic acids, but also by a number of acid salts. Weak and sparingly soluble acids, however, such as carbonic, boracic, arsenious, uric, carbolic, and tannic acids, are without action.

Solvent Action of Hydrochloric Acid on Mercurous Chloride. F. Ruyssen and E. Varenne. (*Comptes Rendus*, xcii., 1161–1163.) The tables published by the authors show that the solubility of mercurous chloride in hydrochloric acid varies with the length of contact, and with the relative proportions of salt and solvent acting upon each other. The solubility is increased by the presence of silver chloride.

Solvent Action of Hydrochloric Acid on Silver Chloride. F. Ruyssen and E. Varenne. (*Bull. Soc. Chim.* [2], xxxvi., 5.) The authors find that one part of silver chloride is soluble in 244 parts of hydrochloric acid. Although the addition of water decreases the solubility coefficient, the decrease is not directly proportional to the quantity of water added. The presence of foreign metals slightly assists the solvent action. The authors have ascertained that the presence of mercurous chloride retards to an extraordinary degree the solution of silver chloride, one part of which in presence of even a small quantity of mercurous chloride, requiring 3,158,152 parts of hydrochloric acid.

Solubility of Mercurous Chloride in Solution of Mercuric Nitrate. E. Drechsel. (*Journ. f. prakt. Chemie* [N. F.], xxiv., 46.) Calomel, when gently heated with a solution of mercuric nitrate, is dissolved owing to the formation of mercuric chloride and mercurous nitrate. This decomposition accounts for the fact that a solution of mercuric chloride, in the presence of an excess of mercuric nitrate, fails to produce a precipitate on the addition of mercurous nitrate.

Separation of Silver from Lead. E. Donath. (*Wien. Akad. Ber.*, lxxxii., 733.) If the nitric acid solution of the two metals be treated with 4–5 c.c. of pure glycerol, a slight excess of ammonia,

and 10–15 c.c. of concentrated solution of sodium or potassium hydrate, a clear solution is obtained, which, upon heating to the boiling point for from three to five minutes, throws down the whole of the silver, leaving the lead in solution. The precipitated metallic silver should be washed with hot dilute acetic acid. The presence of bismuth or copper does not interfere with the process.

Volumetric Estimation of Lead. M. Roux. (*Bull. Soc. Chim.* [2], xxxv., 596.) The solution of the lead salt is mixed with a saturated solution of sodium acetate, then precipitated with a standard solution of potassium bichromate, and the excess of the latter determined by means of a standard solution of ammonio-ferrous sulphate, potassium ferricyanide being used as indicator.

For estimating lead when alloyed with tin, the alloy is decomposed with nitric acid, the resulting liquid treated with sodium acetate, the precipitated tin dioxide removed by filtration, and the lead estimated in the filtrate by means of potassium bichromate as described.

The Detection of Lead in Potable Waters by means of Potassium Bichromate. S. Harvey. (*Analyst*, 1881, 146.) The author considers potassium bichromate as preferable to sulphuretted hydrogen for the detection of lead in potable waters. He recommends one-fourth of a litre of the water to be acidified with a drop or two of acetic acid, and to be agitated in a stoppered cylinder with a few minute crystals of potassium bichromate. Lead, if present in the proportion of one part in $3\frac{1}{2}$ millions, may thus be detected by the turbidity produced.

The Alleged Solubility of Cadmium Sulphide in Ammonium Sulphide. H. Fresenius. (*Zeitschr. für Analyt. Chem.*, xx., 236.) According to a statement published by A. Ditte (*Comptes Rendus*, lxxxv., 402) cadmium sulphide is soluble in ammonium sulphide to such an extent as to render its separation from the sulphides of the arsenic group a very unsatisfactory process. The author finds this statement to be greatly exaggerated, and asserts that the solubility alluded to is too slight to be of moment in the usual course of analysis.

Separation of Cadmium from Zinc. M. Kupfferschlaeger. (*Bull. Soc. Chim.*, 1881, No. 11.) A neutral solution of the sulphates of the two metals is heated to expel the air, and treated in a loosely stoppered test tube with a slip of bright zinc until the action has ceased. The liquid is then decanted, the precipitated cadmium washed first with boiled water and subsequently with alcohol, dried with exclusion of air, and then weighed.

The Volumetric Estimation of Zinc by means of Potassium Ferrocyanide. R. W. Mahon. (*Ber. der deutsch. chem. Ges.*, 1882, 1464.) Fahlberg's statement (*Zeitschr. für Analyt. Chem.*, xiii., 379) that the presence of manganese does not interfere with this titration is shown by the author to be incorrect. In the presence of ammonium chloride a weak aqueous solution of a manganese salt forms a precipitate on the addition of potassium ferrocyanide.

Purification of Zinc Sulphate. M. Prunier. (*Journ. de Pharm. et de Chim.* [5], v., 608.) In the usual process of removing iron from zinc sulphate this metal is first raised from the ferrous to the ferric state by means of either chlorine or nitric acid. The author finds potassium permanganate to be preferable for this purpose. He adds solution of the latter to the acidified solution of the zinc salt until a permanent pink coloration is produced, and then removes both iron and manganese by adding weak ammonia solution until a small quantity of zinc hydrate is precipitated. The liquor is then boiled, cooled, filtered, and the filtrate, after being evaporated at a temperature below the boiling point to half the weight of the original solution, left to crystallize.

Volumetric Estimation of Iron by means of Sodium Thiosulphate. E. Haswell. (*Dingl. polyt. Journ.*, ccxl., 309.) The author modifies Oudemans' method by the use of salicylic acid as indicator and of potassium bichromate as oxidising agent. The solution of sodium thiosulphate is standardized with iron; and the solution of potassium bichromate is prepared of about half the strength of the sodium thiosulphate solution. The indicator is made by dissolving 5 grams of sodium salicylate in a litre of water, and the copper solution by dissolving 2 grams of chloride of copper and ammonium (quite free from iron) in 100 c.c. of water. The process is worked as follows:—

5 or 10 c.c. of the iron solution are measured into a small flask acidified with a few drops of hydrochloric acid, and treated with 1 to 2 c.c. copper solution and a few drops of sodium salicylate solution. If the colour is not a pure violet but olive-brown, the solution must be diluted with water. The sodium thiosulphate solution is then run in drop by drop from a burette until the solution is rendered colourless. The small excess of reducing agent is then titrated back with the potassium bichromate until the solution assumes a faint violet colour. For determinations which do not require absolute accuracy, the titration with potassium bichromate can be dispensed with, as two or three drops (equal to 0·1 to 0·15 c.c. sodium thiosulphate solution) suffice to obtain the

end reaction. The author gives the results of a number of analyses made by this method, which appear to be very accurate.

Preservation of Ferrous Sulphate. E. Johanson. (*Zeitschr. für Analyt. Chem.*, 1881, 555.) The author states that crystallized ferrous sulphate undergoes oxidation the more readily, the more completely it is excluded from the atmosphere. He accounts for this peculiar fact by supposing that the ferrous sulphate exercises an ozonizing action on the oxygen of the air, and that the ozone thus formed oxidises the iron salt the more energetically the less it becomes diluted by mixing with the external air.

Estimation of Ferrous Oxide in the Presence of Ferric Oxide, Organic Acids and Sugar. J. M. Eder. (*Chem. Centr.*, 1881, 469. From *Journ. Chem. Soc.*) This method depends on the fact that potassio-ferrous oxalate precipitates metallic silver from a solution of the nitrate, being converted into ferric salt in presence of a sufficient quantity of silver nitrate; when the solution contains tartaric acid the precipitated silver is free from oxalate, and can be at once weighed. The process is carried out as follows:—The feebly acid liquid is treated with excess of neutral potassium oxalate, and then with excess of silver nitrate. After a few minutes, tartaric acid is added to prevent the precipitation of ferric oxide by ammonia, and then excess of ammonia with a little ammonium chloride. The latter serves to cause the precipitated silver to flake together; the silver is then washed with ammonia and ammonium chloride and weighed. The presence of chlorides does not affect the result so long as silver nitrate is added in excess.

Action of Light upon Ferric Salts. J. M. Eder. (*Les Mondes*, 1881, No. 15.). The ferric oxalates, citrates, and tartrates, and their double salts, as also the mixtures of ferric chloride with organic matter, are all decomposed by the action of light.

Oxalates of Iron. J. M. Eder and M. Valenta. (*Les Mondes*, 1881, No. 15.) The authors describe a yellowish green normal oxalate, a red-brown basic salt, and three double salts containing three molecules of alkali.

Direct Estimation of Alumina in the Presence of Iron. E. Donath. (*Wien. Akad. Ber.*, lxxxii., 729.) A known volume of the concentrated solution containing both metals is nearly neutralized with ammonia, and the iron completely reduced with sodium thiosulphate solution. It is then slowly added to a hot slightly ammoniacal solution of potassium cyanide (containing about 15 to 20 grams of KCy to 0·1 to 0·3 gram of FeO). The solution is cooled as rapidly as possible, rendered acid with acetic acid, and

ammonium carbonate is added in slight excess. The precipitated alumina is generally white, and may be treated as usual. The iron is left in solution as ferrocyanide of potassium.

Separation of Nickel and Cobalt. G. Delvaux. (*Journ. Chem. Soc.*, from *Comptes Rendus*, xcii., 723.) The mixture of the two oxides or sulphides, free from all other metals, is dissolved in aqua regia containing much hydrochloric acid, largely diluted, and saturated with ammonia. Potassium permanganate is added until a persistent rose colour is obtained, and then the nickel with the manganese is precipitated by potassium hydroxide. The precipitate is washed, redissolved, and the process repeated.

The cobalt is precipitated from the mixed filtrates and washings acidified with acetic acid by sulphuretted hydrogen. The mixture of nickel and manganese oxides is dissolved in hydrochloric acid, ammonia added in excess, and the liquid exposed to the air. The manganese becomes oxidised, and is entirely precipitated. The nickel may then be precipitated by sulphuretted hydrogen. The method gives very accurate results, and may be applied on the large scale.

Separation of Magnesium from Calcium, Iron, and the Alkali Metals. Dr. H. Hager. (*Chem. Centr.*, 1881, 468; *Journ. Chem. Soc.*, 1882, 97.) Magnesium oxalate is soluble in oxalic acid in the cold, and does not separate out at all if the solution is mixed with glycerol, but is precipitated completely on boiling for five minutes. Advantage is taken of this fact to separate magnesium from other metals. If calcium is present, both metals existing as carbonates, the finely-powdered sample is mixed with ten times its weight of glycerol and a little water, and then with excess of a 5 per cent solution of oxalic acid; after standing for half an hour the mixture is filtered from insoluble calcium oxalate, which is washed and weighed; the filtrate is boiled for ten minutes and then filtered hot, and the magnesium oxalate collected and washed. Both the oxalates may of course be converted into oxides before weighing. Should the calcium and magnesium be present at first in solution, this is to be mixed with glycerol after neutralization, and treated with ammonium oxalate and oxalic acid to strongly acid reaction, the process being then carried out as before. To separate magnesium from iron, both being in solution as salts, the liquid is treated with glycerol, then with excess of ammonium oxalate and oxalic acid; after boiling and separating the magnesium oxalate, the filtrate is boiled with excess of ammonium carbonate, evaporated, and the glycerol taken up with alcohol, the insoluble ferric hydrate being then washed and weighed in the ordinary way.

Solubility of Magnesium Carbonate in Water Impregnated with Carbonic Acid Gas. M. Engel and J. Ville. (*Comptes Rendus*, xciii., 340.) The authors' results are tabulated as follows:—

Pressure in atmospheres.	Temperature.	Quantity of magnesium carbonate dissolved by a litre of water.
1·0	19·5	25·79 grams
2·1	19·5	33·11 ,,
3·2	19·7	37·3 ,,
4·7	19·0	43·5 ,,
5·6	19·2	46·2 ,,
6·2	19·2	48·51 ,,
7·5	19·5	51·2 ,,
9·0	18·7	56·59 ,,
Pressure in millimeters.		
751	13·4	28·45 ,,
763	19·5	25·79 ,,
762	29·3	21·945 ,,
764	46·0	15·7 ,,
764	62·0	10·35 ,,
765	70·0	8·1 ,,
765	82·0	4·9 ,,
765	90·0	2·4 ,,
765	100·0	—

Estimation of Barium as Chromate. H. N. Morse. (*Journ. Chem. Soc.*, 1881, 848.) The author has examined the method proposed by Frerichs (*Ber.*, 1874, 800, 956) for the estimation of barium in presence of strontium, calcium, and magnesium, viz., by precipitating it from solutions containing acetic acid by means of potassium chromate, collecting the precipitate on a weighed filter, and washing with dilute acetic acid. His experiments—which, however, he regards as merely preliminary—have led to the following conclusions:—

(1) Barium can be precipitated, in presence of acetic acid, by an excess of potassium chromate, nearly, if not quite, as completely as by sulphuric acid.

(2) The precipitate cannot be washed with pure solutions of acetic acid, however dilute.

(3) If a small quantity of potassium chromate be added, the precipitate can be washed with quite concentrated solutions of acetic acid without undergoing solution. By using a wash-liquid containing potassium chromate, barium might perhaps be readily and completely separated from strontium, calcium, and magnesium.

Any other soluble chromate would in all probability protect the barium-compound equally well.

Action of Sulphur on Alkaline Sulphides in Dilute Solutions. E. Filhol. (*Comptes Rendus*, xciii., 590.) The author shows that when a very dilute solution of an alkaline sulphide, such as is found in a mineral water, is boiled with sulphur, a reaction takes place between the sodium hydrosulphide and hydroxide, a polysulphide of sodium being formed: $NaHS + S + NaHO = Na_2S_2 + H_2O$.

Ammonium Tribromide. H. W. B. Roozeboom. (*Ber. der deutsch. chem. Ges.*, xiv., 2398.) Ammonium tribromide, NH_4Br_3, is obtained by adding bromine to a concentrated aqueous solution of ammonium bromide. As the mixture cools it slowly deposits the salt in the form of large red prisms resembling potassium bichromate in colour. On exposure to air it parts with bromine.

Compounds of Ammonia with Hydrochloric, Hydrobromic, and Hydriodic Acids. L. Troost. (*Comptes Rendus*, xcii., 715.) The author has previously shown the existence of several new haloid compounds of ammonia (see *Year-Book of Pharmacy*, 1881, p. 90). The present paper deals with the same subject, showing that altogether the following combinations of this kind are known, while he has obtained indications of compounds containing still more ammonia.

ClH, NH_3	BrH, NH_3	IH, NH_3
	$BrH, NH_3 + NH_3$	$IH, NH_3 + NH_3$
$ClH, NH_3 + 3NH_3$	$BrH, NH_3 + 3NH_3$	$IH, NH_3 + 3NH_3$
$ClH, NH_3 + 2(3NH_3)$	$BrH, NH_3 + 2(3NH_3)$	$IH, NH_3 + 2(3NH_3)$.

Estimation of Potassium as Platinochloride. MM. Zuckschwert and West. (*Zeitschr. für Analyt. Chem.*, xx., 185; *Journ. Chem. Soc.*, 1881, 941.) In a circular sent to the German potash manufacturers in May, 1880, Tatlock strongly recommended the use of a method of his own for the determination of potash. The authors have, at the request of the Stassfurt manufacturers, very carefully tested Tatlock's method, and compared it with that recommended by Fresenius (*Quantit. Anal.*, 6th edit.). They find that the results obtained by Tatlock's method are invariably about 0·35 per cent. *too low*.

Fresenius' method has been somewhat simplified at Stassfurt, without materially influencing the accuracy of the results, and is there carried out as follows: 10 grams of the well-mixed sample are dissolved in 500 c.c. water, and 20 c.c. of this solution are

mixed in a basin with 7 c.c. of platinum chloride solution, containing 10 grams of platinum in 100 c.c. The contents of the basin are evaporated on the water-bath to a syrupy consistence, and after cooling, the solid mass is mixed with 10 c.c. of strong (95 per cent) alcohol, the solution filtered through a weighed filter, and the washing with alcohol repeated two or three times. The residue of platinochloride is dried for about half an hour at 110–115° C. As a rule not more than 50 c.c. alcohol is used.

Analysis of Commercial Potassium Iodide. O. Kaspar. (*Analyst*, vi., 203; *Journ. Chem. Soc.*, 1881, 96; *and Pharmaceut. Zeitung*, 1881, 653.) A normal solution of mercuric chloride is prepared by dissolving 2·71 grams of $Hg\,Cl_2$ in cold water (1 c.c. = 0 06643 gram $K\,I$). 10 grams of potassium iodide are dissolved in 50 c.c. of water, and to 5 c.c. of this solution the mercuric chloride is added until a permanent reddish yellow opalescence appears, at which point all the iodide is converted into the double mercuric potassium iodide, $Hg\,Cl_2 + 4\,K\,I = Hg\,I_2 . 2\,K\,I + 2\,K\,Cl$. It is advisable to prepare the mercuric chloride solution as it is required.

Volumetric Estimation of Potassium. L. L. de Koninck. (*Revue univers. des Mines*, 1881, No. 2.) The potassium is precipitated as platinochloride in the usual manner, the precipitate collected on a filter, washed with alcohol, then quickly dissolved in boiling water, and the hot solution reduced by means of magnesium. The platinum is thus thrown down in the metallic state, while the whole of the chlorine is obtained in a soluble form. After complete reduction the mixture is filtered and the chlorine titrated in the neutral filtrate with nitrate of silver in the usual way. From the quantity of chlorine thus found, that of potassium may be readily calculated.

The Use of Potassium Permanganate in Volumetric Analysis. C. Zimmermann. (*Ber. der deutsch. chem. Ges.*, xiv., 779.) In titrating iron by means of permanganate, the presence of free hydrochloric acid often causes inaccuracies in the result. To prevent this the author suggests the addition to the acid liquid of an aqueous solution of about 4 grams of manganese sulphate previous to the titration.

Observations on the Application of Potassium Permanganate in Water Analysis. A. Dupré. (*Analyst*, 1882, 1.) The water should be heated with the permanganate in a flask and not in a beaker or dish. Variations in the temperature do not affect the result much in the case of pure waters, and only very slightly in

the case of impure samples. In the latter case the duration of the heating considerably influences the completeness of the reduction, and requires to be extended in some instances to four hours. The extent of the excess of the permanganate used does not appear to materially affect the result. Boiled water absorbs more oxygen than unboiled.

Estimation of Nitrates in Potable Waters. J. West-Knights. (*Journ. Chem. Soc.*, 1881, 1173, from *Analyst*, 1881, 56.) The author applies the brucine test for nitric acid to the estimation of nitrates in potable waters, the blood-red colour being permanent if oxalic acid is used instead of sulphuric acid, in applying the test to nitrates. For the purpose are required a potassium nitrate solution containing 0·721 gram per litre (1 c.c. = 0·0001 gram N as NO_3), a brucine solution (1 gram in 100 alcohol), a cold saturated solution of oxalic acid, and a *standard red solution*, prepared by evaporating 10 c.c. of the potassium nitrate solution to dryness, and adding 3 c.c. of the brucine solution and 6 drops of oxalic acid solution, evaporating to dryness, dissolving the residue in water, and again evaporating; the residue is dissolved in water and made up to 100 c.c. This solution should have a bright red colour, and 1 c.c. of it is equal to 0·00001 nitrogen as nitrate.

The water to be examined is prepared in a similar manner. 10 c.c. are evaporated to dryness, and from 0·5 to 2 c.c. of brucine solution added to the residue. The brucine should be just in excess, and the colour a bright red; if it be brown, a fresh quantity of water must be taken, and a larger quantity of brucine added; but if the colour is pink, a smaller quantity of brucine must be used. Three or four drops of oxalic acid are added to the residue, which is treated as in the case of the standard solution, except that the residue after the final evaporation is dissolved in a small quantity of water, filtered into a glass cylinder, and the volume made up to 50 c.c., and the colour compared with from 1 to 10 c.c. of the standard colour. If the colour produced by the water is deeper than that of 10 c.c. of the standard, it must be diluted with two or three volumes of water, and 50 c.c. treated as before; but if it be lighter than that of 1 c.c., a larger quantity of water must be used to begin with.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Indian Opium in Cases of Poisoning. K. L. Dey. (*Pharm. Journ.* 3rd series, xii., 397.) Indian opium is often used in the East for suicidal, but more rarely for homicidal, purposes. For its detection in forensic investigations, the author relies chiefly on the presence of *porphyroxine*, a constituent occurring in Indian but not in Turkey opium. By the employment of the usual modified process of Stas for the detection of aconitine, strychnine, daturine, and other poisonous alkaloids, porphyroxine may be readily isolated and then recognised by the application of diluted hydrochloric acid and heat, when a rich purple colour is developed. The quantity of opium present is determined by the degree of development of the colour. This test alone is sufficient to detect the presence of Indian opium, and as this appears to be the only kind used in opium poisoning cases in India, its employment will facilitate the detection of opium, at a great saving of the labour and trouble incurred in conducting the usual analysis.

A corroborative test, which might be next followed in discovering the presence of other and more important constituents of opium, is to digest the fluid after the ether has been extracted with amylic alcohol, which dissolves these constituents of opium (morphine and meconic acid), and to which the usual tests may be applied.

Lastly, by the employment of another corroborative test, namely, the treatment of amylic alcoholic extract with bisulphide of carbon, iodic acid and water, a purple colour may be developed, indicative of the amount of morphine present. In all investigations of this kind the author prefers to determine the relative amounts of morphine and meconic acid as compared with that of porphyroxine. In his opinion the absence of porphyroxine indicates the absence of Indian opium. If Turkey opium is employed for poisoning, no porphyroxine can be found; but in the case of Indian opium this base

will always be detected along with relatively large proportions of morphine and meconic acid.

Indian Opium. (*Pharm. Journ.*, 3rd series, xii., 439.) The latest reports from the British consuls in China point to a considerable reduction in the imports of Indian opium into that country. This is most marked in the case of Malwa opium. The falling off does not appear to be due to a decrease in the consumption, but among other causes to a sophistication of the Indian with Persian and native-grown opium. Formerly it was very difficult to adulterate Malwa opium so as to escape detection; but the improvement in the quality of the Persian opium in recent years has favoured the practice, and the product of 1879 is said to have so closely agreed with Malwa in colour that a mixture of the two, if the proportion of Persian were not too large, was indistinguishable to the eye and also to the taste of the ordinary smoker. The Persian opium of 1880 was, however, so yellow, and inferior in quality, that it could not be used in any quantity. Persian opium is never used alone for smoking, owing to the burning sensation it produces in the throat.

Opium Assay. E. R. Squibb. (*An Ephemeris of Materia Medica, Pharmacy, Therapeutics, and Collateral Information*, January, 1882.) The author gives an elaborate account of a modification of Flückiger's process of opium assay. The report being unsuited for abstraction, and too long for insertion in this volume, reference must be made to the original paper, or to the reprint of the same in the *Pharmaceutical Journal*, 3rd series, xii., 724.

A Rapid Mode of Opium Assay. MM. Portes and Langlois. (*Journ. de Pharm. et de Chim.*, Nov., 1881; and *Chem. News*, xlv., 67.) Take from an average sample 7 grams of the opium; weigh out 3 grams of slaked lime, and measure 70 c.c. of distilled water. Mix the opium and the lime very carefully, adding the water in small fractions, and leave the mixture for half an hour, stirring from time to time. Throw the whole upon a filter, and collect 53 c.c. of the liquid in a small glass provided with a lid. Add to the liquid 10 c.c. of ether, and agitate. Dissolve in the liquid 3 grams of ammonium chloride, shake to promote solution, and allow to settle for two hours. Decant off the ether, replace it by a fresh quantity, agitate, and decant again. Collect the precipitate of morphine upon a filter without folds and 10 centimetres in diameter, and wash the precipitate and the vessel with a few c.c. of cold distilled water. Wash the precipitate in the vessel which has served for precipitation by means of 50 c.c. of distilled water. Add 5 c.c. of dilute sulphuric acid, containing 1·617 per cent. by

measure of $H_2 S O_4$, and 4 drops of neutral litmus. If the liquid becomes red the opium does not contain 10 per cent. of morphine, but if it is blue it exceeds the normal standard. To find the deficiency or the excess: if the opium is too weak, drop in with the burette a standard alkaline solution till the liquid is neutralised; if too strong, apply a titrated acid in a similar manner.

Formation of Mould in Opium, and its influence on the Proportion of Alkaloids. C. Bernbeck. (*Pharmaceut. Zeitung*, 1881, 487.) The author calls attention to the great liability of opium to fungoid growths, and lays stress upon the necessity of drying the fresh opium immediately after purchase at a temperature of 25–30° C., and then keeping it in tin boxes. If the precaution of drying be neglected mould will soon make its appearance, and will gradually diminish and destroy the aroma of the opium, as well as materially reduce its alkaloidal value. A sample which at the time of purchase was found to contain 10·36 per cent. of morphine (calculated for the perfectly dry drug), was analysed again after it had been kept for 3 months and allowed to get mouldy. At the end of that time it had almost entirely lost its characteristic odour, and proved to contain only 9·87 per cent. of morphine, showing a loss of 0·49 per cent. Subsequently it was again analysed and found to have suffered a further decrease of this alkaloid.

Piscidia Erythrina. (*Pharmaceut. Zeitung*, 1881, 518.) This drug is a substitute for opium, and is prepared from the root bark of a tree growing in Jamaica. It possesses narcotic properties similar to morphine and chloral, but differs from these in its action by dilating the pupil of the eye. It is usually administered shortly after meals, as otherwise it is liable to produce nausea.

Reactions of Aloes. Dr. W. Lenz. (*Zeitschr. analyt. Chem.*, xxi., 220. From *Amer. Journ. of Pharm.*, 1882, 357.) By the examination of a number of specimens of authentic varieties of aloes, and a comparison of their reactions with those of extracts of rhubarb, senna, frangula bark, and buckthorn berries, the author found that the reaction of Bornträger, appearance of a red coloration by the addition of ammonia to the benzin extract of the liquid, is not characteristic of aloes, as the other named substances, when treated in the same manner, also produce red colorations which cannot be plainly distinguished from those obtained with aloes. The behaviour towards ferric chloride and iodinized potassium iodide, which Klunge has recommended, the author also considers unreliable for the detection of aloes. The reaction of Bornträger, which is attri-

buted to the presence of aloetin, is also produced by chrysophanic acid.

Reliable results in the detection of aloes are obtained by the method of Dragendorff, which consists in the precipitation of the solutions by neutral acetate of lead, removal of the excess of lead by sulphuric acid, purification of the solution by agitation with ether, and extraction of the aloin with amylic alcohol. In the residue obtained by the subsequent evaporation of the amylic alcohol the aloes may be detected with certitude; the corresponding residues from rhubarb, senna, frangula bark, and buckthorn berries are much smaller in amount, and show none of the reactions which characterize aloin.

Maracaibo Copaiba. M. Brix. (*Pharmaceut. Zeitung*, 1882, 116; from *Sitzungsber. der Acad. der Wiss. zu Wien*, 1881, 459.) The conflicting statements respecting the chemical constituents of this oleo-resin have induced the author to reinvestigate this subject. His results confirm to a great extent those obtained by Strauss in 1868.

Maracaibo copaiba contains a hydrocarbon of the formula $C_{20}H_{32}$, which furnishes no crystallizable compound with hydrochloric acid, and by oxidation with the chloric acid mixture yields acetic and terephtalic acid. By the treatment of the crude terpene with sodium, there results, after the distillation of the colourless oil, upon further distillation a beautiful dark blue oil, which in thicker layers, is scarcely transparent, but in thinner layers shows a beautiful violet colour. This body is a hydrate of the oil, and corresponds to the formula $3(C_{20}H_{32}) + H_2O$. Phosphoric anhydride converts it again into the original terpene. Besides the latter there exists in the maracaibo balsam a brown hard resin, soluble in alcohol and ether, a yellowish hard resin, sparingly soluble in alcohol, more readily in ether, and melting at 85° C., an amorphous, tough, soft resin, and a crystallizable acid, although in so small an amount that its probable identity with the metacopaivic acid of Strauss could not be definitely established. The extremely small amount of the latter found by the author in the balsam examined by him, as also the previous statements of Bergmann, Buchheim, and Bernatzik, who could obtain no crystallizable acids at all, renders the existence of the latter as belonging to the integral constituents of the maracaibo balsam somewhat problematical. The product which is furnished by the German chemical manufactories as metacopaivic acid and copaivic acid, is not obtained from copaiba balsam, but from gurgun balsam, and is not identical with

Werner's gurgunic acid, which, according to Strauss, is the same as metacopaivic acid. Both of the products which occur in trade melt at 126–129° C., dissolve in ether and alcohol, even that of 80 per cent., and are precipitated from the alcoholic solution by water in the form of beautiful, long needles, with a silky lustre. Although the formula obtained agrees perfectly with that of copaivic acid, $C_{20} H_{30} O_2$, as determined by the analysis of Rose and Hess, yet its want of solubility in ammonia, as also of all acid properties, excludes its identity with the copaivic acid of older authors. The successful production of an acetyl product points to the rational formula $C_{20} H_{28}, (O H)_2$.

Psoralea Corylifolia. K. L. Dey. (*Pharm. Journ.*, 3rd series, xii., 257.) This plant, belonging to the natural order *Leguminosæ*, is a native of various parts of India, and is commonly found in the vicinity of villages during the rainy and cold seasons. It is an annual, erect, from 3 ft. to 4 ft. high. Leaves simple, rarely ternate, ovate-cordate, scallop-toothed; stipules recurvate. Racemes long-peduncled. Bracts three-flowered. The seeds are somewhat ovate, very small, of a dark brown colour, and possess an aromatic and bitter taste.

The oleoresinous extract prepared from the seed, and diluted with simple unguents, has been found specifically efficacious in the cure of leucoderma (white leprosy).

The white leprosy is regarded in India as a most loathsome disease. All other kinds of medicine, either native or European, have failed to effect a cure.

As leucoderma is a purely skin disease, it only affects the pigmentary particles of the skin, without producing any constitutional disturbance. The drug produces a peculiar effect on the affected part by its application, for it stimulates the blood-vessels very differently from the other vascular stimulants of the British Pharmacopœia.

After application for some days the white particles appear to become red or vascular; sometimes a slightly painful sensation is felt. Occasionally some small vesicles or pimples appear, and if these be allowed to remain undisturbed, they dry up, leaving a dark spot of pigment which forms as it were a nucleus. From this point, as well as from the margin of the patch, pigmentary matters gradually develope, which ultimately coalesce with each other, and thus the whole patch disappears. It is to be observed that where a large part is affected, or small patches in different parts of the body, the most exposed parts are to be selected first,

and the application to be continued till the cure is effected. It is also remarkable that the appearance of fresh patches is arrested by its application.

The cure is, however, tedious in advanced age, say after forty years. When the circulation is languid, an interval chalybeate tonic is necessary to expedite the recovery. In children and adults the recovery is almost certain if the application be continued for some time. It is also remarkable that the cure is effected more readily in all other parts of the skin than those where the dermis is most thickened, as the sole of the foot, the palm of the hand, the lips, etc.

Notes on Styrax. Dr. E. Mylius. (*Ber. der deutsch. chem. Ges.*, 1882, 945.) If the portion of styrax soluble in boiling petroleum ether be treated in small portions of about 5 grams each with equal weights of sulphuric acid, the mixture after a minute boiled with water and the resulting resin treated with ether, a white crystalline mass is left undissolved, which can be purified by dissolving in a small quantity of chloroform. It is thus obtained in the form of delicate crystals which are very difficultly soluble in ether, alcohol, benzol, and petroleum ether, somewhat more soluble in hot toluol and amyl-alcohol, and very readily so in chloroform. It is insoluble in solution of caustic soda, but soluble in cold concentrated sulphuric acid without coloration or decomposition. With warm sulphuric acid it forms a yellowish red solution. Its composition corresponds to the formula $C_{26}H_{40}O_3$. The author proposes the name *styrogenin* for this body.

Gum Arabic. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, xv., 34–37. From *Journ. Chem. Soc.*) This is a reply to Claësson, who disputed the facts of a previous paper by the author (*Year-Book of Pharmacy*, 1881, 116), by stating that arabinose is not identical with lactose, and that only those specimens of gum arabic which yield very little or no mucic acid on oxidation with nitric acid contain arabinose. The author has examined several specimens of gum arabic, including one from Claësson containing arabinose. The mucic acid is estimated in the following manner:—1·5–2 grams of powdered gum are digested at 60° with three times the weight of nitric acid, sp. gr. 1·2, until the whole becomes one solid mass saturated with the liquid. To this is added a like quantity of nitric acid, and it is then brought on to a weighed filter. The residue on the filter is washed thoroughly, and then dried at 100° and weighed. The filtrate and washings are mixed, evaporated down, oxidised with nitric acid, etc., as above. A third oxidation

generally yields only a trace of mucic acid. The results of the analysis, etc., are tabulated in the annexed table :—

Name.	Description.	Mucic Acid per cent. in air-dried Gum.	Rotation.
1. East Indian Gum	Mostly topaz-coloured pieces, some yellow, with pores, a very few colourless long pieces; only a few large lumps.	14·3	Right.
2. Mogadore Gum	Chiefly yellow and red middle-sized pieces, mixed with smaller and colourless; contained a small quantity of impurities, dust, etc.	14·6	,,
3. Cläesson's Gum	Small pieces, partly colourless, partly yellow.	19·5	,,
4. Gum Arabic, Suakin.	Unequal, colourless, yellow, and deep red-coloured pieces; some long, pale yellow, and partly opaque.	21·5	,,
5. Gum Arabic, elect. I.	Almost colourless, mostly small angular pieces, evidently fragments of the large round lumps, full of cracks, which were present.	20·7	,,
6. Gum Senegal, bas du fleuve.	Very large bright yellow transparent lumps, with large air-bubbles and nodular projections on the surface.	21·0	Left.
7. Arabic Acid . .	Prepared from lævo-rotatory gum by Neubauer's method, and from which the author has obtained lactose.	*a*. 23·9 *b*. 24·4	,, ,,
8. Gum Arabic, elect. O.	Externally like 5	23·9	,,
9. Gum Arabic, nat. III., best natural Cordofan Gum.	Lumps larger than 5, very equal in size, yellowish, opaque, full of cracks.	24·0	,,
10. Australian Gum	Large red-brown hemispherical pieces, or stalactites with a flat side.	38·3	,,

The above method is frequently employed to determine if the sugar from gum contains lactose, and in what quantity. Lactose both from milk sugar and from gum yields in one oxidation between 60–70 per cent. mucic acid. The method is also useful for the quantitative investigation of the changes which gums undergo by treatment with dilute sulphuric acid. The author has observed a small quantity of a sugar other than lactose, in Claësson's gum. If this is the arabinose, he cannot understand how Scheibler has obtained it without lactose. He tried an experiment with dilute sulphuric acid and gum at 100°, and even then obtained lactose.

Podophyllin. Dr. V. Podwyssotzki. (*Pharm. Journ.*, 3rd series, xii., 217; from *Pharm. Zeit. für Russland*, xx., 49, 140, 208.) In his investigations, the author used not only commercial specimens of podophyllin, formerly and recently met with, but also some prepared by himself from the root, in which he avoided the artificial colouring occurring in the commercial products. In order to check his experiments, he also used some yellow podophyllin sent to him from America. His experiments led to the following results:—

1. Podophyllin when chewed developed a bitter taste, which by slowly mixing with the saliva becomes intensified, and an after-taste, resembling that of soap-root, is produced. In the throat a peculiar almost acrid sensation is perceptible.

2. Whether extracted by precipitation of the concentrated alcoholic solution with pure or acidulated water or solution of alum, podophyllin is insoluble in cold distilled water. But if it be digested for some time with water in a water-bath, part of it goes into solution, which, after cooling, becomes turbid and emulsion-like, and subsequently lets fall an amorphous precipitate, whilst the liquid assumes a bitter taste. The portion insoluble in hot water runs together like a resin.

3. Pure podophyllin dissolves in spirit of 80 to 95 per cent. The dark brown or grey-brown preparations prove to be the most impure. Petroleum spirit and benzine only remove the fatty constituents from podophyllin.

4. The alcoholic solution is blackened by perchloride of iron. Solutions of the earthy metals produce a yellow turbidity. Solution of podophyllin is also coloured yellow by caustic akalies and solution of sodium carbonate. These latter reagents give at first a slight precipitate, which is subsequently re-dissolved. The phosphate and nitrate of potassium and sodium give an inconsiderable precipitate insoluble in the liquid. In the dilution of the alcoholic solution with water a flocculent precipitate is produced, which can be easily removed by filtration. If the water be acidulated the precipitation is accelerated, but the precipitate is not then yellow. The precipitate obtained by pure water, in drying at a moderate temperature becomes gradually darker and takes a brown-green colour. The precipitate produced by acidulated water (especially with hydrochloric acid) is red-brown, that by alum solution yellow.

5. Chloroform dissolves very readily one portion of the podophyllin, and, indeed, as will subsequently appear, the most important active constituent; also the fatty substances, and in

inconsiderable quantity the colouring matter upon which the different shades of colour of the preparation depend. The chloroform solution is faintly coloured by perchloride of iron, more strongly by alkalies. After evaporation of the chloroform there remains a yellow-brown resinous substance, which gives up to petroleum spirit, upon warming, all colouring matter. As a residue there is then obtained a brittle resinous light-coloured mass. From this ether extracts the darker coloured portion, whilst the other is very difficulty soluble even in warm ether.

6. From the podophyllin, exhausted by chloroform, ether dissolves principally the colouring matter, which is blackened by perchloride of iron, becomes intensely yellow with alkalies, and with lead acetate orange coloured.

7. The constitnent easily soluble in chloroform is precipitated from this solution by petroleum spirit as a white powder, which occurs also with the ethereal solutions; the precipitate is also produced in the chloroform solution by ether. Of the colouring matters soluble in alcohol, chloroform, ether, and petroleum spirit, there remain, after evaporation of petroleum spirit, one as a fatty more or less coloured oil, having the specific odour peculiar to podophyllin, and another which crystallizes in the form of quadrangular colourless scales, partly resembling crystals of cholestrin.

8. Upon heating podophyllin with oil of turpentine it runs together to a dark mass, apparently without any being dissolved; but upon addition of petroleum spirit to the oil of turpentine a white appearance is produced, which is slowly deposited adherent to the sides of the vessel, and consists of resinous matter of the podophyllin.

9. Upon treatment with various solvents one definite portion is dissolved by chloroform; another, perfectly different from the first, is dissolved by ether; a third perfectly distinct part and the remainder is dissolved by alcohol.

10. The reaction of all the above-mentioned solutions is more or less acid, and depends upon the presence of more or less of the peculiar resinous constituents. The ethereal solution contains two resinous substances, and the acidity of this solution is due to the substances more soluble in ether. The difficultly soluble yellow substance, which is blackened by perchloride of iron, and is difficultly soluble in chloroform, has not an acid reaction. If litmus paper be moistened with the above-mentioned solutions, the acid reaction is observable after the evaporation of the liquid, but to observe the reaction clearly on litmus paper moistened with the

chloroform or ethereal solution, it should be subsequently moistened with spirit.

11. The taste of all solutions of podophyllin is more or less bitter and the bitterer it is, the more it contains of the substances soluble in chloroform; *i.e.*, the peculiar resinous substance of podophyllin. The yellow substance blackened by perchloride of iron has not a bitter taste.

12. The portion of podophyllin resin difficultly soluble in ether, after it has been dissolved in it by aid of heat, crystallizes from it during extremely slow evaporation in prisms. This crystallization takes place more favourably the less the solution contains of the acid substances easily soluble in ether. These crystals form in aggregations around the resinous mass. The crystallization can be readily traced with a microscope, but if the acid portion of the podophyllin resin be removed, crystallization is perceptible without.

13. Potassium and sodium hydrate dissolve the podophyllin gradually, a dark product being formed. The podophyllum resin, obtained as a residue from the chloroform solution or by its precipitation with ether, dissolves completely in these alkalies, a certain portion before the remainder, the acid going first into solution. Also the portion blackened by perchloride of iron dissolves in these alkalies to an intensely yellow coloured liquid. In aqueous solution of ammonia probably it does not dissolve completely, and the solution resulting from a portion is dirty green and thick, arising from the undissolved portion. If the mixture contains little caustic ammonia, it resembles a gelatinous liquid. Upon filtering, a reddish brown liquid is obtained, which gradually becomes dirty green. Upon the filter is left a whitish gelatinous mass insoluble in solution of ammonia, which by washing with water gradually becomes colourless. Exactly the same results are obtained in operating with very dilute ammonia solution, probably because only so much ammonia is used as is sufficient for the neutralizing of the podophyllin. In this case of course the process progresses slowly. In pouring off the coloured liquid from the portion insoluble in ammonia, and treating the latter with ether with the aid of heat, upon cooling crystalline needles are formed in the liquid and on the sides of the vessel. The same result is obtained if the residue of the ammoniacal podophyllin solution be treated with ether upon the filter. After washing upon the filter and drying in the open air or in a vacuum, horny-looking granules are formed. The portion soluble in ammonia recovers its acid reaction on eva-

poration of the ammonia in a water-bath and remains a varnish-like mass. The constituent of podophyllin which is readily soluble in chloroform and precipitable from it by petroleum spirit, behaves towards caustic ammonia exactly similarly. If this substance be rubbed up with caustic ammonia in a mortar, the liquid decanted, and the residue washed with water, a white powder is obtained that can easily be filtered off, which is difficultly soluble in ether, but is easily dissolved by alcohol, forming a neutral liquid. By warm ether the powder is more easily taken up, and, after cooling, crystallizes at the bottom in prisms, upon which rest acicular crystals. The acid constituent of the above-mentioned resinous substance can, after the removal of the ammonia, be freed from foreign mixture by lime or baryta water.

14. Lime or baryta water shaken with powdered podophyllin becomes coloured; if to such a solution an acid be added a precipitate is formed. A cold alcoholic solution of podophyllin shaken with milk of lime becomes yellow coloured, and the lime deposited from it is also yellow. If the liquid be filtered, evaporated to dryness, the residue treated with spirit, and the lime precipitated by sulphuric acid, a solution is obtained of the resin substance with only a little colouring matter, which is combined with the lime. If to this solution water be added, a precipitate is obtained, as generally from any podophyllin solution. This dissolves readily in ether, and crystallizes from it upon slow evaporation in silky, colourless needles, whilst a somewhat coloured varnish-like substance is deposited on the sides of the vessel. The crystals are easily soluble in alcohol, more difficultly in ether, and are neutral. The varnish-like substance dissolves readily in ether, has an acid reaction, and is blackened by perchloride of iron. The crystals are insoluble in water, but are very easily dissolved by chloroform, and have a bitter taste. If the residue from a solution of podophyllin in chloroform, which has been treated with lime or baryta water, evaporated to dryness and freed from colouring matters, or the pulverulent deposit which is formed in the chloroform extract when treated with petroleum spirit be dissolved in warm ether, and lime water added to neutralization, a yellow precipitate is produced. The filtrate from this heated and treated with sulphuric acid gelatinizes to a transparent mass. If this be again mixed with sufficient lime water to render it neutral, ether added, the mixture shaken and then heated to remove the ether, a quantity of delicate, colourless, silky, acicular crystals become perceptible swimming in the liquid. But these are partially contaminated with an amorphous

discoloured precipitate. If the aqueous liquid be filtered off from the crystals and concentrated on a water-bath there is obtained, upon decomposition with hydrochloric acid, a precipitate that rapidly settles in the form of a transparent granular mass consisting of spheroidal forms resembling frogs' spawn. This precipitate dissolves readily in water, baryta water, lime water, alcohol, and ether. Upon removing the hydrochloric acid as much as possible by filtration and subsequent washing with water, then dissolving the precipitate with heat in water, removing some undissolved matter by filtration and evaporating, there is obtained a crystalline mass of fine needles, having an acid reaction and a bitter taste. The lime compound of the yellow podophyllin colouring matter (6) dissolves in ether, after removal of the lime by acids. From this solution it crystallizes partially, mixed with the rest of the resinous substance, in yellowish needles, and is partially depoisted as an amorphous yellow powder. Both the crystals and the amorphous powder are blackened by perchloride of iron. The yellow colouring substance is insoluble in water; it dissolves easily in alcohol and ether, but with more difficulty in chloroform, from which, after standing some time, it is slowly deposited in flocks. Ammonia solution dissolves it, but the solution gradually becomes brown, and after decomposition with acids, instead of the yellow colouring substance, there is obtained a discoloured red-brown mass. The purified colouring substance, freed from the alkaline compound, when exposed to the air gradually assumes a greenish colour, which gradually passes to a dirty green.

15. The root of *Podophyllum peltatum* is internally ivory-white, and covered on the outside with a thin brown skin. The spirituous extract gradually becomes redder during evaporation, and finally brick-red. The powder of the root, exhausted with spirit, is at first white, but after exposure to the air becomes red.

The Constituents of Podophyllin. Dr. V. Podwyssotzki. (*Pharm. Zeit. für Russland*, xx., 777, and *Pharm. Journ.*, 3rd series, xii., 1011.) The author has continued his researches on the composition of podophyllin (*Year-Book of Pharmacy*, 1881, 152), and now publishes a complete account of his results.

His investigations enabled him to isolate all the constituents of crude podophyllin, both active and inactive, and he ascertained that the activity resided in a definite resinous substance, podophyllotoxin, which could be split up into an inactive resin-acid, picropodophyllic acid, and an active neutral crystalline substance, picropodophyllin. The latter was the source of much trouble during the investigations,

since, when combined with the resin-acid, it is easily soluble in dilute alcohol, but if freed from the acid it instantly crystallizes in the presence of water. It is soluble in ether, chloroform, and very strong spirit, but the addition of hot water to the latter solution causes the immediate separation of crystals of picropodophyllin. This neutral crystalline body is the sole active principle in podophyllin, and it is to its presence in the podophyllotoxin that the latter owes its physiological properties. The resin-acid is entirely inert. To the body upon which the colour of podophyllin essentially depends, and which the author has obtained in the crystalline form, he has given the name "podophylloquercetin," which corresponds to its chemical properties. To this body, together with the method of preparation, are due the various shades of colour (green, yellow, and brown) in the commercial product. Of the results of previous investigations the author can only confirm the presence in podophyllin of a resinous substance insoluble in ether and without action on the system, and of two fatty bodies, in addition to decomposition products and inorganic matter.

The author gives the following description of the constituents of podophyllin.

Picropodophyllin.—Colourless, silky, extremely delicate needles, finer than crystals of theine. Very easily soluble in chloroform, readily soluble in 90 to 95 per cent. spirit, sparingly in weaker. 75 to 80 per cent. spirit dissolves so little that it may be used for washing the crystals. It is soluble in ether, and crystallizes from the warm saturated solution on cooling. Water, turpentine, and petroleum spirit fail to dissolve it, but hot fixed oils take up a little, which is slowly deposited in crystals on cooling. On allowing a solution in glacial acetic acid to evaporate spontaneously, flat prismatic crystals grouped in crosses are formed. The addition of water to an alcoholic solution of picropodophyllin causes its precipitation in long silky needles. It is soluble also in picropodophyllic acid; the behaviour of such a solution will be subsequently described. All the solutions have an extremely bitter taste and a neutral reaction to litmus. Ammonia does not precipitate an alcoholic solution of picropodophyllin; if such a mixture be evaporated to dryness on the water-bath, the picropodophyllin is changed into an acid amorphous inactive substance, a few grains requiring 4 to 6 ounces of strong solution of ammonia to complete the decomposition. The physiological action of an alcoholic solution is identical with that of podophyllin, but is far more powerful. No solution, however, should be employed which is liable to deposit

the picropodophyllin in crystals; consequently hot solutions in weak alcohol or fixed oils should be avoided.

A dose of 0·04 gram administered to a cat, was followed by death after frequent vomiting and incessant evacuation. Injected subcutaneously, it crystallizes where injected, and produces no effect whatever. The ultimate composition is C = 67·71, H = 5·31, O = 26·98.

Podophyllotoxin.—Very bitter amorphous substance, soluble in weak spirit and hot water. It is slowly deposited from the latter in flocks on cooling, and may be precipitated from its alcoholic solution by the addition of a large proportion of water. It is easily soluble in chloroform and in ether, but insoluble in petroleum spirit. It has a slight acid reaction, which may be neutralized by alkalies. If an ethereal solution be neutralized with lime or baryta water, part of the podophyllotoxin passes into aqueous solution, whilst part (picropodophyllin) crystallizes from ether in long silky needles.

Picropodophyllin is a very stable body, melting at 200–210°, not decomposing until the temperature reaches 260–275°, and capable of withstanding energetic treatment with alkalies. It dissolves on continued warming with picropodophyllic acid, and on evaporating the solution an amorphous resinous mass is obtained possessing all the characters of podophyllotoxin, and yielding picropodophyllin on heating with ether and alkali. By precipitating a chloroform solution with petroleum spirit, white pulverulent podophyllotoxin may be obtained.

Podophyllotoxin is easily assimilated by the system; its action is the same as that of picropodophyllin, since it is to this body alone that the podophyllotoxin owes its physiological properties. The latter is more rapid in action, as the insoluble picropodophyllin cannot separate out unless the intestine contains sufficient alkali to effect this, or the use of alkali has been involved by the mode of administration.

Pure podophyllotoxin is a white powder, resinous to the touch. The solution in chloroform should not deposit flocks on the addition of ether, which would point to contamination with podophyllic acid. Nor should ferric chloride produce a dark brown tint, indicating the presence of podophylloquercetin.

The ultimate analysis gave the following numbers:—C = 67·62, H = 7·46, O = 24·92; but different samples were found to vary a little, due no doubt to the difficulty of completely freeing it from podophyllic acid and podophylloquercetin.

Picropodophyllic Acid.—This acid is not of importance in respect

to its physiological action, but is of interest as being the substance which holds the crystalline picropodophyllin in solution and renders it capable of being assimilated. The preparation of picropodophyllic acid in a state of purity is a matter of great difficulty, as it cannot easily be separated from traces of picropodophyllin. It belongs to the class of resin-acids, being precipitated by water from its alcoholic solutions, and by acids from its combinations with metals of the alkaline earths. It dissolves in hot water, but is slowly deposited again on cooling.

If podophyllotoxin be heated on the water-bath with lime or baryta water until the acid reaction is neutralized, the almost clear solution thus obtained gelatinizes on cooling. If to the hot filtered solution an acid forming a soluble salt with the alkali used is added, flocks are precipitated which are seen under the microscope to consist of small transparent jelly-like globules enclosing delicate crystals. The latter consist of picropodophyllin, the amorphous mass of picropodophyllic acid. The barium and calcium salts of the latter dissolve picropodophyllin, which is, however, deposited in crystals on liberating the picropodophyllic acid by means of a stronger acid.

When completely freed from picropodophyllin, picropodophyllic acid is without any action whatever on animals; but if contaminated with that substance, the activity varies directly with the amount of contamination present. It was found impossible to obtain it in a state of chemical purity, so that a combustion could not be made; the only method of freeing it from traces of picropodophyllin is treatment with ammonia, which results in the simultaneous formation of decomposition products.

Podophylloquercetin crystallizes in very short needles of yellow colour and metallic lustre. It has no emetic or aperient action, but the pains in the intestines which sometimes follow the administration of the official podophyllin appear to depend upon its presence, for it was only when podophylloquercetin was intentionally mixed with podophyllotoxin that pains in the lower part of the body were observed in animals to which it was given. These effects are not produced by the podophyllic acid of former authors.

Podophylloquercetin is easily soluble in alcohol and ether, sparingly in chloroform, and completely insoluble in water. With ammonia, potash, and soda, it forms beautiful bright yellow solutions, but the combinations with the alkaline earths are insoluble. It is usually obtained in the amorphous condition, but may be crystallized, though with difficulty, from an ethereal solution.

Continued action of alkali decomposes it. Exposure to air changes the colour to a green, and this is the origin of the greenish tint sometimes observable in officinal podophyllin. It melts at 247–250° C., at which temperature it commences to decompose, partially subliming in minute yellow crystals. Perchloride of iron colours the solution dark green. Neutral acetate of lead produces an orange-yellow precipitate, soluble in acetic acid. In many respects it closely resembles other quercetins. Its composition is $C = 59{\cdot}37$, $H = 4{\cdot}01$, $O = 36{\cdot}62$.

Podophyllic Acid.—This term is used by the author to designate that portion of podophyllin that is insoluble in ether and petroleum ether, but soluble in alcohol and chloroform. It is insoluble in water, and has no action on the system. The impure appearance of podophyllotoxin is frequently due to contamination with podophyllic acid, and this is the case if the treatment with ether has been omitted.

The author recommends the following methods for the preparation of the constituents of podophyllin :—

Podophyllotoxin.—This is better prepared from the root than from the crude podophyllin. The coarsely powdered root is extracted with chloroform, either by maceration or percolation. The chloroform must be as free from alcohol as possible, otherwise considerable quantities of podophylloquercetin, etc., are dissolved, which complicate the purification of the podophyllotoxin, and for the same reason the root should be exhausted cold, not on the water-bath. The chloroform is distilled from the liquid until the residue has attained a syrupy consistence, when it is slowly poured into two volumes of pure absolute ether. Or ether may be added in small quantities at a time with frequent stirring, until, on further additions, no more precipitation takes place. Podophyllotoxin and fatty matter are dissolved by the ether-chloroform mixture, whilst podophyllic acid separates in flocks. An insufficiency of ether may, therefore, result in the non-precipitation of some of the podophyllic acid, but an excess cannot be injurious. On no account should ether that is contaminated with alcohol be used, as it retains podophyllic acid in solution, which cannot afterwards be removed. To ascertain if that substance has been completely precipitated, ether is gently poured on to the ether-chloroform solution, when the appearance of flocks indicates the presence of podophyllic acid.

The ether-chloroform solution is poured off on to a filter, and allowed to drop into about twenty times its volume of petroleum

spirit. From each drop, as it falls into the petroleum spirit, a white powder separates, whilst fixed oil and crystalline fat dissolve. If an insufficient quantity of petroleum spirit has been used, the deposited powder adheres together or forms small lumps, which easily retain fatty matter, and even a part of the powder itself may pass into solution if too much of the ether-chloroform mixture be present. The more the powder is contaminated with podophyllic acid, the more liable will it be to form agglutinated lumps. If this is the case, the podophyllotoxin must be subjected to a purification, it being first completely precipitated by the addition of more petroleum spirit.

The precipitated podophyllotoxin is dried at a temperature not exceeding 35° C., and dissolved in the smallest possible quantity of chloroform. This chloroformic solution is filtered into petroleum spirit, adding a few drops of water so as to moisten the precipitate as it falls. It should be allowed to settle, and then collected and dried at a low temperature. If properly prepared, it should form a white or pale yellow powder, and may be preserved in ordinary glass bottles, as it is not decomposed by light.

Podophyllotoxin may also be prepared from podophyllin by the same method; but it must be borne in mind that podophyllin contains decomposition products, formed during the progress of manufacture, from which the podopyllotoxin is not easily freed. Pure podophyllotoxin must be very easily soluble in chloroform, and the solution must remain clear on the addition of ether, but deposit white flocks when mixed with petroleum spirit. Perchloride of iron should not colour the alcoholic solution green. It is not completely soluble in aqueous solution of ammonia; the alkali should remove the picropodophyllic acid only, and, if too much ammonia has not been used, a gelatinous mass is obtained in consequence of the separation of picropodophyllin. If to this mass ether is added, gently warmed and shaken, the picropodophyllin dissolves in the ether, and may be obtained in acicular crystals by evaporating the ethereal solution.

Picropodophyllin.—This body may be prepared from podophyllum resin or root. In either case, however, the podophyllotoxin must be first extracted, but not necessarily in a state of purity; it may be obtained by exhausting the resin or root with chloroform, evaporating the chloroformic solution to complete dryness, and thoroughly extracting with boiling petroleum spirit. The residual brown powder is impure podophyllotoxin. It is dissolved in a small quantity of alcohol, freshly slaked lime added in considerable

excess, and the whole dried in the water-bath. The dry mass is then powdered and exhausted by repeatedly boiling with absolute, or at least very strong, alcohol, and filtering through a heated funnel. On cooling, the concentrated alcoholic solution deposits the picropodophyllin in long, snow-white, silky crystals. They are collected, washed with 50 per cent. spirit containing a little ammonia, to remove the last traces of picropodophyllic acid, as well as colouring matter, etc., and finally dried at a low temperature, during which the crystals aggregate to felted, silky masses. The filtrate and washings may be concentrated to obtain the picropodophyllin still in solution. All the solutions of picropodophyllin have an intensely bitter taste.

Picropodophyllic Acid may be obtained from podophyllotoxin by treatment with ammonia. Owing to the decomposing action of the alkali, it is very difficult to obtain picropodophyllic acid quite pure, especially in sufficient quantity for chemical analysis.

Podophyllic Acid separates out on the addition of ether to the chloroformic solution of the crude podophyllotoxin; it may be washed with ether and purified by repeated treatment with chloroform and ether.

Both the fatty substances present may be isolated from the petroleum spirit solutions obtained in preparing podophyllotoxin. The residue left after distilling off the solvent crystallizes on standing.

Podophylloquercetin can be best obtained from podophyllin that has been prepared without the use of alum. After exhausting with chloroform and petroleum spirit, the podophyllin is dried and extracted with ether, which removes podophylloquercetin with but little impurity. The residue after evaporating the ethereal solution, is treated with acetate of lead, with which podophylloquercetin forms a compound soluble in acetic acid. This compound is decomposed in the usual manner, the podophylloquercetin being taken up with ether. On evaporating this solution, it is finally obtained in the form of a yellow powder, gradually turning green on exposure to air. Sulphuric ether precipitates it from ammoniacal solution in minute yellow crystals. It may also be obtained by sublimation in yellow shining crystals.

The author suggests the following doses for podophyllotoxin:—

As a single dose for an adult, $\frac{1}{4}$ grain may be administered; this is most advantageously given in spirituous solution before bedtime. If no effect is produced during the following day, the dose may be repeated in the evening. In cases of obstinate constipation, as

much as $\frac{1}{2}$ grain, but never more than $\frac{2}{3}$ may be given in the evening, and followed by a second in the course of the next day. For a little child $\frac{1}{120}$ to $\frac{1}{60}$ grain, for older children $\frac{1}{12}$ grain is a sufficient quantity. In no case should a second dose be given within ten hours after the first, as the action is not rapid. The following formula is a convenient one:—

℞ Podophyllotoxini . . . . . . gr. iiss.

Solve in—

Spirit. rectific. . . . . . . ℈ x.

Dose for an adult, 30 drops in wine or brandy; for children, 1 to 10 drops in sweetened water or milk.

The administration may be followed by lemonade or any acid drink, or wine, but alkalies should be carefully avoided for at least two or three hours.

The antidote, in cases of poisoning, would be soda water, or magnesia, or any alkaline liquid, followed by almond milk or emulsion of almond oil.

In reviewing the methods in use for the preparation of podophyllin, the author rejects the use of alum, as tending to convert part of the picropodophyllin into its insoluble crystalline form. It is better to use a little hydrochloric acid in precipitating the resin.

The author finally reviews the various hypotheses advanced by previous investigators as to the nature of the active principle of podophyllin, and comes to the following conclusions:—

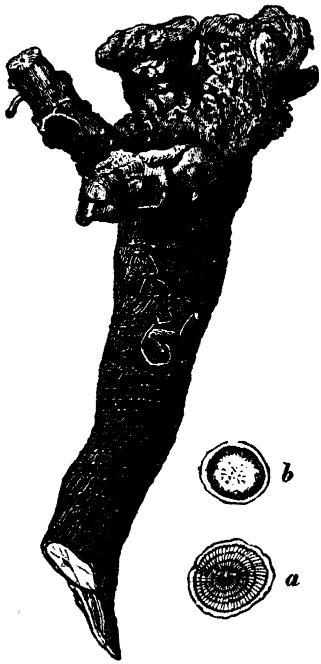
Guareschi's opinion that the active principle is a glucoside is incorrect; berberin is not contained in podophyllin, and cannot therefore have anything to do with its activity, as has been maintained by several authors; Buchheim's theory that it is an easily decomposable anhydride has also been shown to be incorrect, as well as Power's opinion that the activity is due to podophyllic acid. The neutral crystalline picropodophyllin is the sole active principle in podophyllin and podophyllum root.

The original paper contains a chronologically arranged list of publications bearing upon podophyllin, as well as descriptions of the botanical and microscopical characters of the podophyllum plant.

A False Belladonna Root. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xii., 741.) The root reported upon by the author has been identified by Prof. Flückiger as that of *Medicago sativa*, and is stated by him to be sometimes met with on the Continent as an adulterant of belladonna root.

In size and colour the medicago root closely resembles that of belladonna, but differs in the following particulars :—

The crown of the root is divided into three or four woody branches, which are solid. The tap-root is hard and woody, and broken only with difficulty. The outer surface is more or less covered with small scattered warts, and when scratched with the nail does not leave a white mark. The transverse section presents a woody structure, and when it is wetted the cortical portion is seen



ROOT OF MEDICAGO SATIVA.—*a*, TRANSVERSE SECTION OF ROOT. *b*, TRANSVERSE SECTION OF BELLADONNA ROOT.*

to be of a white colour with a yellowish meditullium traversed by a number of white medullary rays (fig. *a*). When the transverse surface of the root is moistened, a leguminous odour, somewhat resembling that of the pea, becomes perceptible, and the flavour is similar. The taste of the root is at first sweet, like that of liquorice, and afterwards bitter and somewhat acrid, irritating the fauces.

* The woodcuts of this and subsequent illustrations were kindly lent by the Editor of the *Pharmaceutical Journal.*

Belladonna root is generally crowned with the *hollow* bases of the leafy stems, and the epidermis is easily scratched off by the nail, leaving a white starchy spot wherever abraded. The transverse surface of the root exhibits a narrow cortical portion of a yellowish or pale brown colour, divided by a dark line from the large meditullium or central portion. The latter is also of a pale brown colour, and shows, irregularly scattered through its substance, but more numerous towards the cortical portion, a numer of darker dots (fig. *b*), which when examined through a lens are seen to be vascular bundles in which the openings of the large porous vessels are visible, the vessels being surrounded by a few wood cells which give the dark colour to the dots. The taste of the root is starchy and slightly bitter, without subsequent acridity. The root breaks with ease. Both the medicago and the belladonna contain starch, the grains being much larger and more muller-shaped in belladonna, and forming sometimes duplex or triple granules; other granules appear circular or oblong oval, according to their position. In medicago the starch grains are somewhat similar, but smaller. There are also present in the latter root a number of linear-oval grains, presenting a well marked linear hilum. There is much less starch in this root than in belladonna, and the iodine test therefore gives a comparatively faint reaction. Neither root appears to contain tannin. The best marks by which to distinguish the medicago root therefore are the radiated structure of the meditullium, its woody character, and consequent resistance when an attempt is made to fracture it.

The root here described by the author was of German origin. In his opinion it is likely to be of frequent occurrence among belladonna root imported from that country.

A False Senega. G. Goebel. (*Amer. Journ. of Pharm.*, 1881, 321.) The author describes a root under the name of *southern senega* as being other than the root of *Polygala senega.* This false senega has no keel to the root, but a larger head or crown, and loosely adherent bark; it is more difficult to powder, and is much less acrid than the true drug. The proportion of polygalic acid found in the false senega was only three per cent., while that of the *Polygala senega* was five per cent. It is evident, therefore, that this drug, although probably derived from a species of *Polygala*, cannot be substituted for the true drug.

A False Senega. Dr. J. H. Gunn. (*New Remedies*, 1881, 208, and *Pharm. Journ.*, 3rd series, xii., 83.) Attention is called by the author to a *Polygala* (since determined by Dr. L. Johnson to be

Polygala Boykinii, Nuttall), growing abundantly in central Alabama, and possessing expectorant properties. This plant differs from the true seneg in having a branched stem, obovate leaves in whorls of four or five, and stalked flowers.

A False Senega. Prof. J. M. Maisch. (*Amer. Journ. of Pharm.*, 1881, 387.) In 1876 W. Saunders directed attention to a root, of which large quantities were then in the market, and which was sold as senega, but was deficient in acridity.

The same root has likewise been noticed in Europe. Among others, it was described by T. Greenish (see *Year-book* 1878, 523), who regarded it as young and immature senega, a conclusion which did not agree with the author's observation. E. Siebert (*Amer. Journ. of Pharm.*, 1880, 469) suggested that this false senega might be derived from one of the numerous Central American species of *Polygala*.

Recently, Dr. J. H. Gunn (see the preceding abstract) reported upon a plant which had been successfully used in place of senega, and this plant was recognised as *Polygala Boykinii*, Nuttall. A specimen of this plant, with root, was sent by this gentleman to the author, who describes it as closely resembling senega root, but being entirely destitute of the keel-like line of the latter, and having in all its parts a woody column of circular appearance in the transverse section. He found the root to be identical with the specimens of false senega in his collection, and also to agree in its microscopic structure with that previously described by T. Greenish, and more recently by G. Goebel (see this volume, p. 167).

The plant is one of the herbaceous perennial species of *Polygala*. Several slender stems are produced from the same root, and rise to the height of twelve or eighteen inches without branching. The leaves are in whorls of about five, attain a length of about an inch, and vary between lanceolate and obovate in shape, the upper ones being even linear, and sometimes alternate. The flowers are interminal, slender, rather dense spikes, and are of a whitish colour, with roundish, partly green wings. The seeds are hairy, and have a caruncle of about two-thirds the length of the seed. The plant flowers from May or June to July or August, and grows in rich calcareous soil in Georgia and Florida, and westward.

The Root of Ipomœa Pandurata. C. Manz. (*Amer. Journ. of Pharm.*, 1881, 385.) This root, commonly known as man-root, man-of-the-earth, wild jalap, and wild potato, is elongated, cylindrical, two or three feet long, one to several inches thick, and abruptly contracted above to the thickness of a finger. It appears

in commerce in transverse and longitudinal slices, with the bark slightly overlapping. The longitudinal slices are from five to eight inches in length, and from one to two or more inches in width.

The root is of a brownish grey colour externally, and greyish white internally, and presents protrusions of resinous matter due to a resinous milk-juice, which exudes when the root is cut while fresh. A transverse section of the root shows a cortical portion of about one-eight of an inch in thickness, with resin cells forming a dense zone near the cambium line; internally it consists of a parenchymatous portion, which is somewhat depressed, and contains numerous wood bundles radiating from the centre, and numerous resin cells. The root has a short and rather mealy fracture, a sweetish odour, and a sweetish, afterwards bitter and slightly acrid, taste.

The author's analysis of the root shows that it contains a resin with an acid reaction, soluble in ether, and operating as a cathartic in two hours after being taken in doses of 3 grains for an adult, causing considerable griping and watery stools. The root, therefore, approximates more to Tampico than to Vera Cruz jalap in the character of its resin.

Researches on the Root of Gelsemium Sempervirens. Dr. T. G. Wormley. (*Amer. Journ. of Pharm.*, 1882, 337.) In a former communication (*Ibid.*, Jan., 1870) the author announced that *Gelsemium sempervirens* contained a non-nitrogenized principle, of an acid reaction, which was named *gelseminic* or *gelsemic* acid; and also a strongly basic principle, which was named *gelsemine.*

From a subsequent examination of the constituents of the plant, M. Sonnenschein and C. Robbins concluded that the so-called *gelsemic acid* was identical in properties and composition with the glucoside *æsculin*, found in the bark of the horse-chestnut and certain other barks (*Ber. der deutsch. chem. Ges.*, 1876, 1182).

In order to test the accuracy of this statement, the author has now re-investigated the character and properties of gelsemic acid along with those of æsculin, and has fully satisfied himself of the non-identity of the two principles. He also adds the following further information respecting the reactions and properties of the alkaloid gelsemine.

1. *Sulphuric acid* dissolves gelsèmine with a reddish or brownish colour to a solution which after a time assumes a pinkish hue. If the solution be warmed on a water bath, it acquires a more or less purple or chocolate colour.

If a small crystal of *potassium bichromate* be slowly stirred in the

sulphuric acid solution, reddish purple streaks are produced along the path of the crystal. If the potassium salt be used in the form of *powder*, or as advised by Sonnenschein and Robbins, be replaced by *ceric oxide* ($Ce\ O_2$ formerly $Ce_3\ O_4$), the purplish or reddish purple coloration manifests itself more promptly and strongly, and may be obtained from even the one ten-thousandth grain or less of the pure alkaloid. For the detection of these minute quantities, however, it is essential that only very minute quantities of the acid and powder be employed.

This reaction of gelsemine—as remarked by Sonnenschein and Robbins, who first observed it with the cerium compound—resembles somewhat that of strychnine; but these alkaloids could not thus be confounded.

2. *Nitric acid* causes gelsemine to assume a brownish green, quickly changing to a deep *green*, colour, which slowly diffuses itself through the liquid. Almost the least visible quantity of the alkaloid, if touched with only a very minute drop of the acid, will yield this green coloration in a marked degree.

This reaction readily distinguishes gelsemine from strychnine and the other alkaloids.

Solutions of the *salts* of gelsemine are colourless, and have the strongly bitter taste of the alkaloid. These solutions yield precipitates with a number of different liquid reagents, even in some instances when highly dilute; but in no instance is the reaction peculiar to this alkaloid.

Physiological action.—0·008 gram ($\frac{1}{8}$ grain) of gelsemine, administered hypodermically to a cat, caused very marked symptoms in fifteen minutes, and death in one hour and a half.

0·010 gram given to a frog, produced, after half an hour, great prostration, followed by tetanic convulsions and death in about four hours.

0·033 gram of the alkaloid, in the form of chloride, was injected into the peritoneum of a frog. The animal soon opened its mouth convulsively, the jaws fell at intervals, and there was quickly great muscular prostration. In twenty minutes the body was completely relaxed; the muscles not irritable under pricking; reflex action was greatly diminished, and life seemed to be extinct. On opening the thoracic cavity, it was found that the heart had been arrested in diastole, and was not irritable.

The author also gives directions for the detection of gelsemium in poisoning cases, based on the isolation and recognition of the two principles, gelsemine and gelsemic acid.

Osmorrhiza Longistylis. H. L. Green. (*Amer. Journ. of Pharm.* 1882, 149.) This plant belongs to the order Umbelliferæ, and is commonly known as sweet cicely, sweet root, paregoric root, or sweet anise. It is a perennial herb indigenous to the rich moist woods of the United States and Canada, growing as far south as Virginia, and west as far as Oregon. The plant has never been recognised by medical authorities, but its rhizome and roots are to some extent used throughout the country in the form of infusion and fluid extract. The rhizome is 1–2 inches long, and has attached to it a number of fusiform roots from 3–12 inches in length and $\frac{1}{8}$ to $\frac{3}{8}$ of an inch in diameter, of a light brown colour when fresh, but darkening on drying. Both roots and rhizome possess a strong aromatic odour and taste recalling those of anise.

The author's chemical examination of this drug shows the presence of a resin, fatty matter, a glucoside, albumen, starch, and a small quantity of a volatile oil which is heavier than water, and solidifies at 38° F. to a crystalline mass resembling oil of anise.

Zygadenus Paniculatus. E. Jones. (*Amer. Journ. of Pharm.*, 1881, 439.) The author states that the bulbs of this plant contain a glucoside, to which their poisonous properties are attributed. Convulsions and speedy death follow the eating of the bulbs of this plant. No antidote is yet known for it.

Recognition of Black and Green Hellebore. Prof. A. Herlandt. (*Journ. Med. Pharmacol. Bruxelles*, 1881, 347; *Amer. Journ. of Pharm.*, 1882, 303.) The author recommends exhausting the bruised rhizome of *Helleborus niger* or *H. viridis* with boiling water; the filtered decoction, on being boiled with one-third its volume of hydrochloric acid, becomes rapidly turbid and acquires a violet tint. On cooling black flocks are separated, which are collected upon a filter and washed with ether to remove fat and resin, when the paper will be of a deep violet colour, depending upon the production of helleboretin. The reaction may be obtained with 0·05 gram of the rhizome, which is to be boiled with 10 c.c. of water. On the addition of ammonia the colour of the flocks changes to dirty yellow, but the original colour is restored on the addition of acid. The results are less satisfactory if sulphuric acid is employed in place of hydrochloric acid. The rootlets of hellebore give but slight traces of helleboretin. The reaction is not obtained with the rhizome of *Actœa spicata* or with senega.

Althæa Rosea. E. Claassen. (*New Remedies*, 1881, 325.) The well-known presence of asparagin in the root of the marsh mallow (*Althœa officinalis*) has induced the author to examine the root of

the allied species, *althæa rosea*, for the same constituent. One hundred parts of the fresh roots were crushed and extracted with cold water, with the addition of a small quantity of quicklime, in order to render the mucilage insoluble. The extraction was once more repeated, and the clear liquid evaporated to the consistence of syrup, or about $6\frac{1}{2}$ parts. This extract was precipitated with an equal weight of alcohol, the precipitate (about $3\frac{1}{4}$ parts) diluted with half its weight of water, and again precipitated with alcohol (about an equal quantity = 5 parts). The crystalline precipitate formed by this operation was separated from the liquid by collecting it on a cloth; it was then pressed, dissolved in hot water, treated with animal charcoal, and crystallized. The weight of the pure white crystals was equal to 0·2 part.

The Constituents of Zingiber Officinale. Dr. J. C. Thresh. (*Journ. Chem. Soc.*, from *Pharm. Journ.*, 3rd series, xii., 721.) It has been shown that besides a volatile oil, the ethereal extract of ginger contains seven different constituents, of these the following have been studied :—

The neutral resin is represented by the formula $C_{16}H_{24}O_3$. On fusion with potash, which acts on it only with difficulty, a crystalline acid is obtained which gives a green coloration with ferric chloride, changing to red on addition of soda.

Resin α.—The portion of the ethereal extract not volatilized in steam and soluble in alcohol contains two resins, α and β, besides the active principle, and a fourth substance, probably a terpene polymeride. The resins are only incompletely separated by precipitation with basic lead acetate, the precipitate being sparingly soluble in alcohol; whilst excess of lead acetate carries down some of the active principle. The precipitate is decomposed with sulphuric acid, excess of acid removed, and the solution fractionally precipitated. A brown lead salt, consisting chiefly of the α-resin, is first precipitated, which is purified by repeating the above process, then boiling with benzene until nothing further is taken up by that solvent, and finally drying at 100–200°. The resin is very hard and brittle, of a jet-black colour, and having the composition $C_{46}H_{54}O_{10}$. All attempts to crystallize it have failed. It forms two lead salts, a neutral salt, $PbC_{46}H_{52}O_{10}$, and a basic salt, $Pb_2O_3C_{46}H_{52}O_{10}$. By fusing it with potash an acid is obtained similar to that yielded by the natural resin.

Resin β.—By repeated fractional precipitation, this resin is obtained free from volatile oil, and probably from the α-resin. It is soft, and of a red-brown colour. Its composition is represented

either by formula $C_{43}H_{60}O_8$, or $C_{43}H_{58}O_8$, the former agreeing better with the results obtained by the analysis of the barium salt.

Terpene (polymeride).—By removing all traces of the resins α and β from the alcoholic solution by repeated precipitation with lead acetate, separating excess of lead with sulphuric acid, distilling in steam to remove the alcohol, treating the residue with hot light petroleum until it ceases to extract anything, and cooling the solution, a straw-coloured fluid is obtained. The petroleum solution, after treatment with alcohol to separate the active principle, and distillation, yields a thick oily straw-coloured substance, of bitter and somewhat pungent taste and aromatic odour. When heated, it volatilizes with partial decomposition. It is insoluble in potash, and its analysis leads to the conclusion that it is a hydrocarbon polymeric with terpene.

Gingerol.—The active principle has an alkaline reaction, and gives precipitates with lead, barium, and magnesium salts. When heated to 100°, it slowly loses weight, its colour darkening at the same time; boiling water and alkali decompose it, and it oxidizes readily under the influence of nitric acid and chromic mixture. The facility with which it decomposes renders its isolation a matter of great difficulty. A more extended examination of this substance is to follow.

Examination of the Root of Berberis Aquifolium: variety Repens. H. B. Parsons. (*New Remedies*, March, 1882.) This plant is found in the mountainous regions of Oregon, California, Utah, Colorado, Nevada, and Montana, from which latter section the sample here examined was received.

The roots, as received, were in broken pieces, about a foot in length and one-fourth of an inch in diameter; they had a brownish exterior layer, underneath which was a bright yellow layer. The powdered sample has a bright lemon-yellow colour and a decidedly bitter taste.

The root is said to be much used, in the form of decoction, for the treatment of what is known as the "mountain fever," among the western miners. By them it is reported to be an efficient tonic and antiperiodic, capable of replacing salts of quinine in the treatment of malarial disorders.

In 1837 a French physician, Piorry, stated that he preferred a properly made extract of the root of *Berberis vulgaris* (a closely related plant) to quinine salts, in all diseases where "he found the spleen enlarged in a patient suffering from ague, intermittent or hectic." Some years later, his former pupil, Dr. L. M. Klein, made

further experiments in treatment of fevers in Algeria, and he strongly confirmed the statements of Piorry. As the root of *Berberis vulgaris* (the common "barberry" of the Eastern States) is very similar in composition to the root of *Berberis aquifolium*, variety *repens*, the therapeutic action of the two is likely to be about the same, and the statements based on the trials of the one are probably applicable to the other. Be this as it may, the fact remains that recent trials in the United States seem to show that the tonic properties of *Berberis aquifolium* are unquestionable, and eclectic practitioners have long claimed that its antiperiodic virtues were equally well defined and established.

A careful chemical analysis of the powdered roots reveals the presence of two alkaloids, to which, in all probability, can be ascribed the medicinal effects of the roots. None of the substances were of a character likely to have any decided activity.

The first alkaloid, *berberine*, is the substance to which the yellow colour of the root is due; it is freely soluble in alcohol, moderately soluble in water, and in chloroform and ether. Its taste is decidedly bitter. It forms sparingly soluble lemon or orange-yellow salts with sulphuric, hydrochloric, and nitric acids, and salts more freely soluble with acetic, phosphoric, and hypophosphorous acids.

This alkaloid is removed from the plant by water; much more readily if a little acetic acid is used.

The alkaloid and its salts have been used as a tonic, and as an antiperiodic, and glycerin solutions of the alkaloid are still considerably employed in treatment of ulcerated surfaces.

The second alkaloid is called "*oxyacanthine;*" it is a white, bitter difficultly crystallizable solid, which changes to a light yellow colour if it is long exposed to the air in a moist condition. The presence of a little caustic or carbonated alkali seems to intensify this colour, and may possibly cause the change. If this alkaloid be treated with dilute nitric acid in excess, and slightly warmed, it gives off nitrous vapours, and is converted partly into a yellowish red resin-like substance, and a soluble substance much resembling berberine in colour, and precipitated by Mayer's solution. It may be possible that this alkaloid is closely related to berberine; a similar action occurs with hydrastine.

There seem to be no statements regarding the medicinal properties of oxyacanthine. As it is easily prepared, the matter might readily be investigated. It may be separated from the mother-liquors, after berberine has been crystallized from extracts of *Berberis aquifolium* or *B. vulgaris*, by adding a very slight excess of

sodium carbonate solution with constant stirring. The yellowish precipitate should be allowed to separate; it can then be washed on the filter until nearly free from berberine, dissolved in dilute hydrochloric acid; and again precipitated by careful addition of ammonia. After washing and drying, the substance is moderately pure. It may be further purified by crystallization from alcohol. It cannot be crystallized from chloroform alone.

The reactions and other chemical properties will be found in a tabulated form in the original article.

The complete quantitive analysis of the root shows the following composition:—

Moisture		6·08
Ash, soluble in water	1·63	
Ash, insoluble in water	2·08	
		3·71
Crude fibre		23·33
Albuminoids insoluble in water and alcohol	3·15	
Albuminoids soluble in alcohol, insoluble in water	1·68	
		4·83
Berberine		2·35
Oxyacanthine		2·82
Black substance with oxyacanthine		0·23
Resin, insoluble in ether, soluble in alcohol		1·91
Sugar (traces), organic acids extractive, and colouring matter		4·55
Ether extract, chiefly Wax		1·36
Gum and yellowish colouring matter		5·56
Starch isomers, by titration		18·05
Substances extracted by acid and alkali, determined by difference		25·22
		100·00

Asclepias Cornuti. W. L. Hinchman. (Abstract of an inaugural essay. *Amer. Journ. of Pharmacy*, 1881.) The rhizome of this plant is long and comparatively slender, reaching from one to six feet in length, from one-half to one inch in diameter, and runs horizontally about six inches below the surface of the ground. It is thickened at intervals of ten or twelve inches, where the overgrown stems shoot out; otherwise it is uniform in size, and at the end has generally three rootlets. It has a thick bark, externally brown, the interior white, and contains a number of laticiferous ducts, somewhat scattered, but principally placed in two irregular lines. In drying, the bark shrinks very much, and is finely

wrinkled longitudinally, and somewhat figured at intervals, leaving the wood exposed. The wood, of a yellowish colour, is hard and brittle, breaking with a resinous fracture; it contains a large number of medullary rays and also ducts, which are visible to the naked eye. The rhizome has a disagreeable, nauseous taste, and a slight odour. The fresh rhizome loses 70 per cent. on exposure to the air, and an additional 10 per cent. when dried on a water-bath. Upon incineration, the dried rhizome leaves 6 per cent. of ash.

The author's chemical examination of the rhizome shows the presence of the following substances:—Asclepion, caoutchouc, fixed oil, tannin, glucose, a bitter principle, gum, starch, volatile oil, and the usual ash constituents.

The asclepion was isolated by extracting the powdered drug with benzol, evaporating the liquor, then freeing the residual sticky extract from the supernatant oil, exhausting the washed extract with strong alcohol, and allowing the latter to evaporate. It forms wart-like, odourless, and tasteless crystals, irridescent in the sunlight, and readily volatilizable at a moderate heat. They are neutral to test-paper, soluble in chloroform, benzol, ether, and alcohol, but insoluble in water. In contact with strong sulphuric acid and bichromate of potassium they give a green colour. With strong sulphuric acid and chlorinated lime, they give at first a brown colour, but on standing a short time this turns to a purple.

Woodcuts of the rhizome and of the microscopic structure of its sections and starch granules accompany the original articles.

The Roots of Apocynum Androsæmifolium and Apocynum Cannabinum. E. A. Manheimer. (*Amer. Journ. of Pharm.*, 1881, 554.) The close botanical relation of the two plants named suggested a microscopic examination of their roots, both of which are recognised as medicinal agents. The two plants, which resemble each other, are indigenous to the United States; but the *A. androsæmifolium* or dog's-bane, grows chiefly in the northern part, while the other species, called Indian hemp, is common in the southern part of the country.

The root of dog's bane is long, about $\frac{1}{8}$ or $\frac{1}{4}$ inch thick, somewhat branched, externally dark brown, internally white. The bark is thin, longitudinally wrinkled, somewhat fissured transversely, and is readily separated from the wood; the cambium line in the dry root is quite indistinct. The wood is fibrous, tenacious, and encloses a pith of the same width as the bark, or even broader, and surrounded by a distinct medullary sheath. The wood is almost tasteless, while the bark has an unpleasant taste.

The root of Indian hemp is horizontal, several feet long, and appears in the market in pieces varying in thickness from $\frac{1}{8}$ to about $\frac{3}{4}$ inch. The bark is brown-grey, deeply wrinkled and transversely fissured, about one-fifth the width of the root, and in the dry state has an indistinct cambium line. The wood is yellowish, soft, porous, more particularly in the outer portion, breaks readily with a smooth even fracture, and is without, or almost without, pith. Both bark and wood have a bitter taste, but that of the former is more persistent. The stems, which are sometimes mixed with the root, have a smooth red-brown bark, which is not very thick, and a pith which has generally disappeared, leaving the stem hollow; they have a slightly sweetish taste.

Under the microscope, the dog's bane shows in the pith a few vessels and much starch; the cells are largest near the centre, and are more or less compressed towards the wood, which is traversed by many medullary rays, and contains, chiefly in the outer portion a number of vessels. The bark is composed of oblong cells, differing in size, and containing starch; a few laticiferous vessels are seen, and several groups of thick-walled bast cells, arranged somewhat in a circle near the middle of the bark.

The root of *A. cannabinum* shows, in the transverse section, in the centre a few small round cells. Then follows the wood, showing about three annual layers, vessels somewhat arranged in rows, and many medullary rays running into the bark. The cells of the bark are roundish, contain an abundance of starch, and also numerous laticiferous vessels.

The author also examined microscopically the root that had been sold to him as that of *A. androsæmifolium*, and found it in most respects to agree physically and microscopically with the roots of *A. cannabinum* examined by him, the differences observed (two circles of wood, curved medullary rays, etc.), being of no importance. He thinks it quite likely that much of the fluid extract of *A. androsæmifolium* which is sold, is made of *A. cannabinum*.

Woodcut illustrations of the sections will be found in the original article.

Aspidium Rigidum. W. J. Bowman. (*Amer. Journ. of Pharm.*, 1881, 389.) This fern is indigenous to the Pacific coast, and is confined principally to the Eastern slope of the coast range extending northward to Oregon and southward to Mexico. The rhizomes are from 4–10 inches in length, closely covered with the remnants of stipes, and with these from an inch to an inch and a half thick. They are covered with a brown chaff, and densely beset with wiry

rootlets. The rhizomes deprived of the stipes are from one-half to nearly an inch in diameter, and show, upon the transverse section, an arrangement very similar to that of *Filix mas*, the main difference being that the vascular bundles, found in a circle, are about six in number. It has a peculiar aromatic odour and a sweetish taste, which becomes acrid, bitter, and astringent. Its medicinal properties correspond to those of *Filix mas.*

The author's chemical examination of the rhizome shows the presence of an oleo-resin similar to that contained in *Aspidium Filix mas*, filicic acid, fat, tannin, glucose, gum, pectine, and starch.

The Bark of Fraxinus Americana (White Ash). Prof. F. B. Power. (*Amer. Journ. of Pharm.*, March, 1882.) Experiments conducted under the author's direction by H. M. Edwards, in the laboratory of the Philadelphia College of Pharmacy, indicate the presence of an alkaloid in the bark under notice. The body in question is apparently quite a strong base, and is, with a considerable degree of probability, the principle upon which the therapeutical virtues of the bark depend; the preparation of the bark which has been most successfully employed for obtaining its specific action being a wine, for which a formula has been given by Mr. Thomas S. Wiegand.

The object of this brief notice is primarily to make known the observation, which is attended with special interest from the fact of no alkaloid having as yet been observed in plants of the natural order of *Oleaceæ*, and to reserve to himself the right of continuing this research. An early account of the characters of this new alkaloid is promised.

Assay of Cinchona Bark. Dr. J. de Vrij. (Abstract of a paper in the *Nieuw Tijdschrift voor de Pharmacie in Nederland*, January, 1882. From *Pharm. Journ.*) In the *Archiv der Pharmacie* for August, 1881, two methods for the estimation of the total alkaloids in bark were proposed by Prollius, one of which the author has tested, and now recommends as yielding, with a slight modification, excellent results.

The principle of the method referred to consists in using for the extraction of the alkaloids a mixture of 88 parts (by weight) of ether, 8 of alcohol (92 to 95 per cent.), and 4 of liquid ammonia. Prollius directs 10 grams of this liquid to be taken for every gram of bark, but the author recommends the proportion of menstruum to be doubled.

The following is the method as modified by the author: 10 grams of finely powdered bark are introduced into a well-closed bottle, and,

after being carefully tared, 200 grams of the ethereal liquid are added. The whole is now shaken at intervals during an hour, this length of time having been ascertained by comparative experiments to be sufficient. The bottle is then again weighed, and if evaporation have taken place, the necessary quantity of ether mixture is added.

As much as possible of the clear liquid is now poured off into a flask and the bottle again weighed; the difference in weight gives the amount of solution taken. The ether is then recovered by distillation, and the residual liquid, containing alkaloid and waxy matter, is transferred to a tared porcelain dish, containing a glass rod, the flask being washed with a little spirit. The evaporation is now continued on the water-bath until the weight is constant. This gives the amount of crude alkaloid. For instance, 10 grams of succirubra bark were digested with 200 grams of ethereal liquid. 159·8 grams of the clear solution gave a residue of 0·78 gram, or 9·76 per cent. of crude alkaloid.

To estimate the pure alkaloids, the crude residue is dissolved in dilute hydrochloric acid, filtered, washed as long as the washings precipitate with solution of soda, and the whole made alkaline and shaken with chloroform. After standing twelve hours the clear chloroformic solution is run into a flask and evaporated by distillation. The residue is transferred with a little spirit to a tared dish and stirred and heated on the water-bath till the weight is constant. Particular attention should be paid to the latter point. In the instance referred to, 0·648 gram of alkaloid was obtained, equivalent to 8·11 per cent., or about 1½ per cent. less than the amount of crude alkaloid. The author is of opinion that by estimating the crude alkaloid, and deducting 1½ per cent., a result will be arrived at, with loss of but little time, which, for the practical purposes of the pharmacist, will be sufficiently near the truth. Of course the same method is applicable for the examination of Ext. cinch. liq. (De Vrij).

From a sample of chinchona bark 10·01 per cent. of pure alkaloid was obtained, whilst a former estimation by the lime and spirit method had yielded 10·02 per cent. The close agreement of these two determinations confirms the reliability of this method, which the author confidently recommends.

Sassy Bark. MM. Harnack and Zabrocki. (*Archiv für exp. Path. and Pharmak.*, xv., 403. From *Pharm. Journ.*) The paper contains an account of an interesting investigation of the chemical and pharmacological properties of the active principles of this

bark. The principal experiments were made with what the author calls the free base "erythrophleine," and describes as a thick yellow syrup with a distinctly alkaline reaction; but as neither this body nor its compounds with acids could be obtained in a crystalline form, it does not correspond altogether to the description of the alkaloid to which the name erythrophleine was first applied by Messrs. Gallois and Hardy, (*Year-Book of Pharmacy*, 1877, p. 170). The authors found that the amorphous body was easily decomposed, in a manner analogous to atropine, into an acid ("erythrophleinic acid") and a volatile base ("manconine"), the composition of which has not been ascertained. A special point of interest is that while "erythrophleine" appeared to exercise to a certain extent the physiological action of both digitalin and picrotoxin, the two decomposition products did not behave like either.

Preparations of the Bark of Rhamnus Purshiana. G. W. Kennedy. (*Druggists' Circular and Chemical Gazette*, August, 1881.)

Formula for Fluid Extract.

Rhamnus Purshiana	℥ xvj.
Alcohol (95 per cent.)	f. ℥ vjss.
Water	f. ℥ iijss.

Reduce the drug to a moderately fine powder, mix the alchohol and water, and moisten the drug with the mixture; pack in a glass conical percolator, close the lower aperture tightly with a cork, pour on a sufficient quantity of the menstruum to cover the drug, and permit it to remain undisturbed for four days, after which loosen the cork in the orifice and allow percolation to proceed at the rate of about 40 drops per minute, adding menstruum as proposed from time to time as required, until 10 fluid ounces are obtained; reserve this and continue percolation until the drug is exhausted; evaporate to 4 fluid ounces, add 1 ounce of alcohol, and mix with the reserved portion.

Formula for Elixir.

Take of Rhamnus Purshiana	℥ iij.
Alcohol and Water . . .	sufficient quantity.
Bower's Glycerin	℥ iij.
Oil of Orange	gtt. vj.
Oil of Cinnamon	gtt. ij.

Reduce the drug to a moderately fine powder, mix $8\frac{1}{2}$ parts of

alcohol, $4\frac{1}{2}$ parts of water and the glycerin, moisten the drug with this mixture, pack in a conical glass percolator, closing the lower orifice; let it stand in this condition, after covering the drug with the menstruum, forty-eight hours, then proceed with percolation carefully until $15\frac{1}{2}$ fluid ounces have been obtained; mix the essential oils with $\frac{1}{2}$ an ounce of alcohol, and add this to the percolate, when the elixir is completed, each fluid drachm of which will represent about 12 grains of the active constituents of the drug.

Wrightia Antidysenterica. K. L. Dey. (*Pharm. Journ.*, 3rd series, xii., 257.) *Wrightia antidysenterica* is a plant of the natural order *Apocynaceæ*, growing wild in the hilly districts of the Concan, the Ghauts, and some other parts of India. It is a small shrub, with leaves ovate oblong, or exactly oblong, shortly acuminate, smooth, bright green on each side. Corolla hypocrateriform; throat surrounded by ten lacerated scales. Stamens projecting, inserted in the throat. Anther 1, sagittate, adhering by the middle of the stigma. Ovaries 2, adhering. Style filiform, dilated at the apex. Stigma, narrower. Follicles, distinct or united. 5 to 10 scales at the base of the calyx on the outside of the corolla. Corymb terminal, few flowerets; corolla white, very sweet scented, with a slender tube $\frac{3}{4}$ inch long; limb spreading, flat, with ovate segments. Follicles very long and slender.

The bark, the conessi bark of materia medica, is bitter and astringent, and considered a specific medicine in dysentery and other bowel complaints, in which it has been given, both in acute and chronic forms, with remarkable success. A decoction prepared by boiling 4 oz. of the root-bark in a pint of water down to half the quantity, is generally given in 1 oz. or 2 oz. doses, and has been found very efficacious even in hemorrhagic form of the malady. It has also been employed as a febrifuge; but its efficacy as such is still doubtful. It is, however, a good tonic. The seeds are used for their vermifuge properties, and generally administered by the native physicians in combination with other drugs of a similar nature. When used separately they have also been found to succeed well.

Lonchocarpus Peckolti. Dr. Peckolt. (*Zeitschr. des Oest. Apoth. Ver.*, 1881, Nos. 13 and 14.) In Brazil many poisonous plants, like several species of Serjania, an araceous plant, etc., are called *timbo;* the above is often distinguished as *timbo boticario.* It is a small tree of the Leguminosæ, 4 or 5 meters high, flowers in July, and ripens its fruit in November. The roots are often of the size of a child's arm, externally light brown; the bark internally

yellowish and easily separated from the wood, which in small roots is white, and in thick roots deep yellow. The fleshy bark is employed, and has in the fresh state a penetrating musk odour, similar to that observed near poisonous serpents and crocodiles.

The author obtained from the fresh bark 0·1588 to 0·1727 per cent. of volatile oil, having a strong repulsive musk odour. Sulphuric acid colours it orange-yellow, then yellowish brown. Hydrochloric acid colours it red-brown, then bluish, light blue, becoming paler on boiling, and on cooling deep indigo-blue. The decoction, after precipitation with lead acetate and evaporation, yielded to ether 10 per cent. of extractive, nearly inodorous, but of repulsive taste, producing intoxication. The residue was partly insoluble in alcohol, and consisted mostly of saccharine extractive. The bark also contains albumen, starch, three resins (α-resin, soluble in ether and insoluble in alcohol; β-resin, soluble in alcohol and ether, dark brown, soft; and γ-resin, crystalline floccules from boiling alcohol), two resin acids, a crystalline acid, lonchocarpic acid, and also a volatile poisonous alkaloid, *lonchocarpine*, which is light brown, oily, of a faint musk-like stupefying odour, insoluble in water, easily soluble in accidulated water, ether and alcohol; the hydrochlorate very deliquescent.

In 1,000 grams of the root bark were found: volatile oil, 1·727; lonchocarpine, 0·718; lonchocarpic acid, 1·285; fatty acid, of musk odour, 11·500; wax, 0·171; bitter principle, 1·794; α-resin, 7·967; β-resin, of musk odour, 4·578; γ-resin, crystalline, 2·000; α-resin, acid, of faint musk odour, 2·100; β-resin, odorous, 2·106; extractive, of musk odour, 0·206; albumen, 21·484; starch, 45·312; saccharine extractive, 29·023; tartaric and malic acids and salts, 2·182; dextrin, inorganic salts, etc., 28·212; moisture, 725·399; cellulose, 112·236 grams.

Chernowitz and Langgaard have erroneously stated this bark to be derived from Paullinia and Serjania. The bark is used in Brazil only externally in hepatic affections, splenitis, furuncle, etc., in the form of cataplasm prepared from a decoction of 30 grams to 500 grams of water thickened with manihot starch. Also in the following forms:—

Oleum Lonchocarpi.—Timbo bark, 10 grams; strong alcohol, 10 grams; ground-nut oil, 40 grams. Digest and filter.

Tinctura Lonchocarpi.—Timbo bark, 1 p.; strong alcohol, 5 p.

Unguentum Lonchocarpi.—Alcoholic extract of timbo, 10 grams; tincture of timbo, 5 grams; lard, 70 grams.

Emplastrum Lonchocarpi.—Beeswax, 30 grams; Burgundy pitch

and Venice turpentine, each 10 grams; cocoanut oil, 30 grams. Melt together, and add alcohol extract of timbo and powdered timbo bark, each 15 grams.

Buxus Sempervirens. P. E. Alessandri. (*Annali di Chimica*, April, 1882. From *Pharm. Journ.*) The box-tree contains three distinct principles, viz., *buxine*, in the bark; *buxeine*, in the leaves; and *parabuxine*, in both leaves and bark, but chiefly in the latter.

The chemical and physical characters of the three principles are as follows:—

	Buxine.	Buxeine.	Parabuxine.
Colour . . .	White.	Yellowish white	Purplish red.
Structure . .	Crystalline.	Crystalline.	Amorphous.
Solubility . .	Slightly soluble in water; more so in alcohol; freely in ether.	Soluble in alcohol and ether; slightly so in water.	Freely soluble in water and alcohol, but insoluble in ether.
With HNO_3 . .	Turns reddish purple.	Turns greenish yellow, and then brick red.	Turns greenish yellow, with no approach to red.
With H_2SO_4 . .	Turns brick red.	Turns blood red.	Turns greenish yellow, and then darkens.
With H_2SO_4 and $K_2Cr_2O_7$	Turns canary yellow in the cold. Gives a green cloud when hot that at once disappears.	An orange precipitate; when heated the precipitate dissolves and gives a green solution.	Gives no precipitate, but with heat gives a grass green cloud.

There appears to be comparatively little difference between buxine and buxeine, and it is just possible that further researches will prove them to be one and the same body; parabuxine, however, is sufficiently distinct from either in both its physical and chemical characters. On the exact nature of parabuxine the author declines for the present to give any decided opinion. It appears sometimes to have an acid reaction; but other experiments tend to prove the contrary. If it could be proved beyond a doubt that it was an organic acid, it would explain why it clings so tenaciously to the buxine.

The final method adopted by the author for the extraction of buxine and parabuxine is as follows:—

1. Make a cold infusion of coarsely powdered box bark with a 2 per cent. solution of oxalic acid.

2. Filter and press after twenty-four hours, and exhaust the

remaining bark with a fresh portion of oxalic solution; filter and press again.

3. Concentrate the infusion at a gentle heat, add ammonia in excess, and allow the resulting precipitate to subside.

4. Collect the precipitate on a filter and treat with dilute acetic acid. Precipitate again with ammonia and wash with weak ammonia.

5. Treat the precipitate with hot alcohol and evaporate to one-third.

6. Shake up the residue with ether repeatedly.

7. Evaporate the ether and set aside the undissolved portion.

8. Dissolve again in acetic acid and precipitate. This process gives buxine in a nearly pure condition. This product is nearly white, and may be entirely decolorized by animal charcoal, but a large quantity of the alkaloid is absorbed and lost in the process.

9. The portion undissolved by the ether is treated with acetic acid and mixed with the residual liquor of the first treatment.

10. Evaporate the acetic solution slowly down to one-half, and treat with ammonia. Collect the yellowish magma on a filter. Evaporate the residual liquor down to one-half, precipitate, unite the two precipitates, and wash with weak ammonia water.

11. Wash the magma with ether and dissolve the residue in pure alcohol. This alcohol solution on evaporation yields nearly pure parabuxine.

Instead of acetic acid dilute sulphuric acid may be used for dissolving the first ammoniacal precipitate, and the buxine thrown down with baryta water.

Analogous treatment of the pounded leaves gives buxeine.

The author denies that the alkaloid obtained by Fauré is buxine at all, but a mixture of heterogeneous substances.

Pavia worked with the leaves and twigs, and obtained a mixture of buxine, buxeine, and parabuxine, but in small quantities. Pavia's second process, in which sulphuric acid was used, did not give the pure alkaloid either, for the solvent dissolved out a number of products upon which a cold solution of oxalic acid has no action; besides which he only used the leaves and twigs, and treated the precipitate he obtained with nothing but alcohol, which only gave him an impure mixture, which he took for true buxine.

Barbaglia followed an analogous process, but used sodic and calcic carbonate to precipitate the sulphuric acid solutions, the precipitate being dissolved in pure alcohol. This method of proceeding could not produce pure buxine, because sodic carbonate

will not throw down the alkaloidal principles of box leaves or bark. Barbaglia by this means obtained a mixture, which he sought to purify by dissolving it in alcohol and pouring the resulting solution in a thin stream into distilled water. It is true that by this means a white glutinous deposit is formed; this is not pure buxine, however, but a mixture of that substance and parabuxine. This may be proved by a simple experiment which eluded Barbaglia's vigilance. The mixture containing the white precipitate is shaken up in a test-tube with absolute ether in excess. Part of the precipitate dissolves, and the liquid divides into three layers. The top layer is ethereal, the middle layer contains a number of flocks, and the lowest is aqueous. The ethereal solution when evaporated yields pure white crystalline buxine, the aqueous solution contains impure buxine, and the red flocks are parabuxine.

The author claims to be the first to have obtained pure crystalline buxine, the so-called buxine obtained by Fauré and others being a mixture of alkaloidal and glucosidal principles in proportion varying according to the source from which the substance was extracted, whether from the bark or leaves. Fauré and his successors all admit the existence of what they took to be a resin, in the alkaloidal mixture obtained by them, which could not be separated even by nitric acid, as recommended by Mayer. This supposed resin does not exist; what was taken for a resin is really the principle which the author has called parabuxine provisionally. This body is different in its physical and chemical characters to the parabuxine of Pavia, which was a mixture of buxine and true parabuxine.

The author concludes by remarking that now we have an easy method of obtaining buxine in a reasonable state of purity, the investigations of its value as a febrifuge may be carried on with more certainty than those made with Pavia's buxine, the efficacy of which as a substitute for quinine as an antiperiodic has been so often contested. The true chemical formula of buxine can now be established, and the question of its identity with biberine, asserted by Walz and confirmed by Flückiger, who also states that it is identical with pareirine and paricine, definitely determined.

The author promises to give us another paper detailing his researches into the chemical properties of a number of buxine salts and substitution compounds.

The Bark of Cinchona Cuprea. Dr. C. A. Robbins. (*Pharm. Journ.*, 3rd series, xii., 181, from *Oil, Paint, and Drug Reporter.*) The author has visited Santander, United States of Colombia, where this bark is collected. He says that the tree grows on the lower

mountain ranges adjoining Buccaramanga, at a much lower altitude than any of the known marketable kinds, the good trees not generally growing at a level below 2,000 or above 3,500 feet. The first lots of bark that were shipped were obtained from the higher altitudes, 2,000 to 3,000 feet, and were in most cases of fine quality. A good deal of that which has recently been collected is of very inferior quality, and it is stated that the greater part of it will not yield half as much quinine as the first shipments to London, which sold at 3*s*. 6*d*. to 3*s*. 8*d*. per lb.

A New Alkaloid in the Bark of Cinchona Cuprea. M. Arnaud. (*Comptes Rendus*, Oct. 17, 1881, 593.) The author finds this bark to contain 0·8 per cent. of cinchonine and 0·2 per cent. of a new alkaloid. He obtains the latter by treating the bark with milk of lime, drying the mixture, exhausting with boiling alcohol, treating the resulting extract with hydrochloric acid in excess, and crystallizing. The hydrochlorate of the new alkaloid is less soluble and crystallizes out first, the hydrochlorate of cinchonine remaining in solution. This alkaloid he has named *cinchonamine*. It appears to occupy an intermediate position between quinamine and cinchonine, in having two atoms less hydrogen than the former and two more than cinchonine.

A Peculiar Alkaloid in the Bark of Cinchona Cuprea. Dr. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xii., 497, and *Journ. Chem. Soc.*, 1882, 316.) The bark of the *Cinchona cuprea* yields a substance which separates from the ethereal solution of the alkaloids in long thin plates, and sometimes in needles. It forms a sulphate sparingly soluble in water, thereby differing from cinchonidine and quinidine, but resembling quinine, from which it is distinguished by its slight solubility in ether; its tartrate, however, resembles cinchonidine tartrate by its sparing solubility in water.

It is not all samples of cuprea bark which give indications of the presence of this alkaloid.

New Alkaloid from Cinchona Cuprea. W. G. Whiffen. (*Pharm. Journ.*, 3rd series, xii., 497.) The results obtained by the author confirm those detailed in the preceding abstract. It is further stated that the bark contains 0·1 to 0·8 per cent. of the alkaloid, which is very soluble in alcohol and dilute ammonia, and has a strongly alkaline reaction. Neither cold sulphuric acid nor concentrated nitric acid decomposes it, but with sulphuric acid and potassium bichromate it gives a deep green coloration, and with chlorine water and ammonia an emerald-green coloration. It is precipitated from its aqueous solutions by rochelle salt, but not by

potassium iodide when cautiously added. Its acid sulphate is highly fluorescent, and has a higher rotatory power than quinine sulphate.

Cinchonidine Sulphate	$[\alpha]_j = -135°$
Quinine Sulphate	$[\alpha]_j = -196°$
Sulphate of New Base . . .	$[\alpha]_j = -221°$

The author suggests the name of "ultra-quinine" for this alkaloid until its properties have been further studied.

New Alkaloid from Cinchona Cuprea. D. Howard and J. Hodgkin. (*Pharm. Journ.*, 3rd series, xii., 528.) The authors have discovered in the cuprea bark described by Dr. Flückiger, an alkaloid peculiar to the species, but quite distinct from that described by Arnaud under the name of cinchonamine (see this volume, p. 186). The alkaloid in question is identical, however, with that discovered, independent of the authors and almost at the same time, by Paul and Cownley, and also by W. G. Whiffen (see the two preceding abstracts).

The bark, first imported in 1871, differs much in its extreme hardness and tenacity from all other cinchona barks. During the last few months large quantities have been sent over from Buccaramanga, in the province of Santander, where it is said to form vast forests. The bark varies greatly in value, some specimens containing no quinine, others upwards of 2 per cent.; some quinidine and cinchonine are also found in the bark, but no cinchonidine. The new alkaloid, in its general properties and composition of its platinum salt, closely resembles quinine. It differs only in the solubility of its salts and the readiness with which the alkaloid crystallizes from ether. The author suggests the name "homoquinine." 100 c.c. of ether dissolve 0·57 of the alkaloid at 12°. It is much more soluble when other alkaloids are present, and is very apt to show supersaturation. The sulphate crystallizes in shorter needles than the quinine salt, and contains six atoms of water. Water at 100° dissolves 1 per cent.; at 12°, 0·25 per cent. The disulphate is extremely soluble, and fluoresces. The oxalate, tartrate, hydrochlorate, nitrate, and hydriodate were also prepared. The rotation of the alkaloid and its salts is almost identical with that of quinine. Further investigations on larger quantities of the alkaloid are promised.

The New Alkaloid from the Bark of Cinchona Cuprea. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xv., 854. From *Pharm. Journ.*) The author has studied the properties of homoquinine, the

alkaloid found simultaneously in cuprea bark by D. Howard and J. Hodgkin, B. H. Paul and A. J. Cownley, and W. G. Whiffen. According to J. A. Tod, who observed the alkaloid as far back as the autumn of 1880, this bark contains it very frequently, often to the extent of nearly 0·3 per cent. From him the author obtained the material used in his investigation. The substance was purified by repeated crystallizations from ether. When dried at 120° C. its composition corresponded to the formula $C_{19}H_{22}N_2O_2$.

Homoquinine crystallizes from ether containing water, partly in flat prisms and partly in laminæ. The former contain 2 molecules of water of crystallization, the latter apparently only 1 molecule.

Homoquinine melts at 177° C. (uncorr.); it dissolves freely in alcohol and chloroform, and sparingly in ether, from which it crystallizes in proportion as it can take up water. If dehydrating substances are present, it can apparently only be obtained amorphous. It dissolves in dilute sulphuric acid with blue fluorescence, and with chlorine and excess of ammonia is coloured exactly the same as quinine.

Homoquinine gives with several acids easily crystallizable salts, the aqueous solutions of which yield with potassium iodide only a resinous precipitate. Its sulphuric acid solution immediately decolorizes potassium permanganate.

The neutral tartrate crystallizes in colourless needles, which are sparingly soluble in cold water.

The neutral sulphate, $(C_{19}H_{22}N_2O_2)_2$, $SO_4H_2 + 6H_2O$, crystallizes in short prisms, which are very sparingly soluble in cold water and readily effloresce. (Found 12·50 and 13·37 per cent. H_2O; calculated 13·07 per cent.) Since in respect to solubility in water this salt resembles almost exactly quinine sulphate, the possibility is not excluded that it may also be present in the quinine sulphate of commerce. Nevertheless, for the detection of homoquinine sulphate in quinine sulphate, the process given in the German Pharmacopœia for the testing of quinine is quite useless. On the contrary, Liebig's ether test has proved to answer, if a little more ether be taken.

The acid chloroplatinate is obtained as a yellow crystalline precipitate, having the composition $C_{19}H_{22}N_2O_2$, $PtCl_6H_2 + H_2O$. (Found 26·11 per cent. Pt and 1·95 per cent. H_2O; calculated, 26·42 per cent. Pt and 2·43 per cent. H_2O.)

The Botanical Source of Cinchona Cuprea. J. Triana. (*Pharm. Journ.*, 3rd series, xii., 861.) The cuprea bark at present in commerce is furnished by two very distinct regions: the one, in the

great basin of the river Orinoco, to the South of Bogotá; and the other, which was the one first explored, in the lower part of the basin of the Magdalena river.

Amongst the numerous cuprea barks received from Buccaramanga, or the northern region, there is occasionally found a relatively small quantity, which has been discovered by M. Arnaud to be peculiar in containing, in place of quinine, a new alkaloid which he has called cinchonamine.

Professor Planchon has also observed that the anatomical structure of the bark containing cinchonamine differs from that of ordinary cuprea bark, and has compared it to that of a *Cascarilla*. He concludes that if the cuprea barks have characters in common which place them outside the genus *Cinchona*, they also present amongst themselves such differences that they ought to be considered to form specifically distinct types.

Not only are the cuprea barks of commerce furnished by two distinct districts, but they also belong to two distinct species, which, though nearly allied, are yet different from each other and belong to the genus *Remijia*, which comes very near that of *Cinchona* and to the closely allied genus *Cascarilla*. These species are *Remijia Purdieana*, Wedd. (*Ann. Soc. Nat.* [3], xi., p. 272), a plant formerly discovered by Purdie in the forests of Antioquia, upon the left bank of the Magdalena; and *Remijia pedunculata*, Triana (*Cinchona pedunculata*, Karsten, "Spec. Select.," i., 53, t. 26).

The Bark of Sambucus Canadensis. C. G. Traub. (*Amer. Journ. of Pharm.*, 1881, 392.) The author's chemical examination of this bark shows the presence therein of valerianic acid, volatile oil, fat, resin, tannin, sugar, and colouring matter, besides several compounds, the nature of which was not ascertained. The air-dried drug contains 13 per cent. of water, and yields 8·5 per cent. of ash.

The Bark of Celastrus Scandens. C. H. Bernhard. (*Amer. Journ. of Pharm.*, 1882, 1.) This bark was found to contain: acids in combination—sulphuric, hydrochloric, phosphoric, and silicic; bases in combination—potassium, sodium, magnesium, calcium, and iron; an acid resin and a neutral resin, starch, sugar (glucose), gum, a caoutchouc-like body, colouring matter, extractives, and a volatile oil.

A tincture of the bark made with dilute alcohol is unstable, producing a precipitate partly soluble in ammonia and partly in alcohol. Glycerine will not prevent this deposit; and, as it is more than probable that the activity of the drug is due to the resins and

volatile oil, a better menstruum would be 80 per cent. alcohol, which affords a permanent preparation.

The infusion and decoction are both unsatisfactory preparations; in consequence of the large amount of sugar which the bark contains they rapidly undergo fermentation.

The Quebracho Drugs from the Argentine Republic. Dr. O. Hesse. (*Journ. Chem. Soc.*, 1882, 742.) Not only the amount of alkaloids, but also the number of different bases, contained in the bark of "Quebracho blanco" (*Aspidosperma Quebracho*) varies according to the different sources from which the bark is obtained. No fewer than six alkaloids are contained in the bark from Pilciao, in the Argentine Republic. The alkaloids are obtained by boiling the bark in alcohol. The alcoholic solution is evaporated, soda is added to the residue, and the mixture is extracted with ether or chloroform. This extract is evaporated to dryness, the residue dissolved in dilute sulphuric acid, and the alkaloids precipitated from the acid solution by the addition of caustic soda. On recrystallization from a small quantity of boiling alcohol, a mixture of *aspidospermine*, $C_{22} H_{30} N_2 O_2$, and *quebrachine*, $C_{21} H_{26} N_2 O_3$, is deposited; *aspidospermatine*, *aspidosamine*, and *hypoquebrachine* are contained in the mother-liquor. The crystalline deposit is dissolved in alcohol and mixed with hydrochloric acid; on evaporating the solution, quebrachine hydrochloride crystallizes out. The aspidospermine in the filtrate is precipitated by ammonia, and purified by recrystallization from alcohol; this alkaloid forms colourless prisms and needles (m. p. 206°), freely soluble in absolute alcohol, benzene, and chloroform. The alcoholic solution is lævogyrate. The pure alkaloid gives a magenta coloration with perchloric acid, and possesses the properties ascribed to it by Fraude (*Ber.*, xi., 2189; xii., 1560). It is a very weak base, forming amorphous salts, which, when treated with chloroform, lose a portion of the base.

Aspidospermatine, $C_{28} H_{28} N_2 O_2$. — The bases contained in the mother-liquor, obtained in the preparation of aspidospermine, are converted into acetates. Sodium bicarbonate is added to the mixture, and the precipitate produced removed by filtration. To the clear liquid, a small quantity of ammonia is added to remove the aspidosamine. The filtrate is mixed with soda and extracted with ether. The residue which remains on evaporating the ethereal extract is treated with light petroleum, which dissolves aspidospermatine, but leaves hypoquebrachine undissolved. The aspidospermatine is washed with alcohol, and again recrystallized from light petroleum.

The pure alkaloid forms delicate needle-shaped crystals (m. p. 162°), soluble in alcohol, ether, and chloroform. $[\alpha]_D = -72·3$ for a 2 per cent. alcoholic solution at 15°. Aspidospermatine resembles aspidospermine in its behaviour with perchloric acid and ferric chloride. Aspidospermatine combines with acids, forming amorphous salts. Alkalies produce white precipitates (soluble in pure water) with the solutions of these salts. On the addition of sodio-platinic chloride to the hydrochloride, a pale yellow precipitate is thrown down, which has the composition—

$$(C_{22} H_{28} N_2 O_2)_2, Pt Cl_6 H_2 + 4 H_2 O.$$

The precipitate of crude *aspidosamine*, mentioned above, is dissolved in acetic acid, reprecipitated by ammonia, and is freed from traces of the other alkaloids by washing with light petroleum.

Aspidosamine is almost insoluble in water, but dissolves freely in ether, chloroform, alcohol, and benzene. The alcoholic solution has an alkaline reaction. It neutralizes acids, forming amorphous salts. The aqueous solution of the hydrochloric gives a brownish red coloration with ferric chloride. The platinochloride has the composition $(C_{22} H_{28} N_2 O_2)_2$, $Pt Cl_6 H_2 + 3 H_2 O$. Aspidosamine gives a blue coloration with a mixture of sulphuric and molybdic acids, a dark blue colour with sulphuric acid and potassium dichromate, and a magenta coloration on boiling with perchloric acid.

The crude *hypoquebrachine*, obtained in the separation of aspidospermatine (*vide supra*), is dissolved in acetic acid. The solution is treated with animal charcoal, saturated with sodium hydroxide, and extracted with ether. The extract, on evaporation, leaves the hypoquebrachine, $C_{21} H_{26} N_2 O_2$, in the form of an amorphous mass (m. p. 80°). The alkaloid is soluble in alcohol, ether, and chloroform. It is a powerful base, forming yellow amorphous salts, which dissolve freely in water. The aqueous solution of the hydrochloric gives a cherry-red coloration with ferric chloride, a yellow precipitate which rapidly changes to violet with chloride of gold, and a pale yellow amorphous precipitate with sodium platinum chloride. The platinochloride has the composition—

$$(C_{21} H_{26} N_2 O_2)_2 Pt Cl_6 H_2 + 4 H_2 O.$$

Crude *quebrachine* can be purified by recrystallizing the hydrochloride or sulphate. The alkaloid is precipitated from an aqueous solution of it salts by soda, and the precipitate is recrystallized from alcohol. Pure quebrachine, $C_{21} H_{26} N_2 O_3$, crystallizes in colourless

needles, which melt with partial decomposition at 215°. The crystals dissolve freely in chloroform and boiling alcohol: these solutions deflect the ray of polarised light to the right. For a 2 per cent. solution in alcohol $[\alpha]_D = +62 \cdot 5$ at 15°, and in chloroform $[\alpha]_D = +18 \cdot 6°$. The tests for this alkaloid, and a description of some of its salts, have been previously given by the author (*Ber.*, xiii., 2308. The neutral *oxalate* crystallizes in needles insoluble in alcohol or water. The *tartrate*, $(C_{21}H_{26}N_2O_3)_2C_4H_6O_6 + 6H_2O$, forms colourless plates soluble in water. The *citrate* crystallizes in needles soluble in hot water. The *hydriodide* is an amorphous body; the thiocyanate is crystalline.

Quebrachamine.—The mother-liquors obtained in the purification of aspidospermine by recrystallization from alcohol, deposit crystals of aspidospermine on spontaneous evaporation; on further evaporation, an amorphous residue remains, from which quebrachamine can be extracted by treatment with a small quantity of boiling alcohol. The alkaloid is deposited in colourless plates [m. p. 142°) on the addition of water to the alcoholic solution. Quebrachamine dissolves readily in alcohol, benzene, chloroform, and ether. The alcoholic solution is strongly alkaline, and has an intensely bitter taste. With sulphuric acid and molybdic acid, or potassium dichromate, quebrachamine gives a dark violet coloration. Alkalies produce a white precipitate with solutions of quebrachamine salts. The hydrochloride is amorphous. Quebrachamine has only been met with in one sample of quebracho bark. Its composition has not yet been ascertained.

The physiological action of these alkaloids has been previously described (*loc. cit.*).

In addition to these alkaloids, the bark also contains a neutral substance, to which the name *Quebrachol* has been given. It is obtained by evaporating the ethereal extract of the bark, and treating the residue with a small quantity of hot alcohol; the alcoholic solution, on cooling, deposits colourless crystalline plates (m. p. 125°) of quebrachol, $C_{20}H_{34}O$. The crystals dissolve freely in ether, chloroform, benzene, and acetone. Quebrachol resembles phytosterine in its colour reactions with sulphuric acid, but is less refractive than the latter compound. $[\alpha]_D = -29 \cdot 3$ for a 4 per cent. solution of quebrachol in chloroform at 15°. *Acetyl-quebrachol*, $C_{20}H_{33}O\bar{A}c$, resembles quebrachol in crystalline form. It is less soluble than quebrachol in hot alcohol, but dissolves freely in ether, benzene, and light petroleum.

The bark of *Quebracho colorado* (*Loxopterygium Lorentzii*) con-

tains small quantities of two alkaloids, which may be extracted by the method described at the beginning of this paper. On the addition of potassium thiocyanate to the mixed acetates, one of the alkaloids is precipitated. The second, to which the name *loxopterygine* has been given, is precipitated by adding ammonia to the filtrate. It is a white amorphous substance (m. p. 81°), soluble in ether, alcohol, chloroform, benzene, and acetone. The solutions have an alkaline reaction and an intensely bitter taste. It gives a blood-red coloration with nitric acid, and a violet colour with a mixture of sulphuric and molybdic acids. Loxopterygine probably has the composition $C_{26} H_{34} N_2 O_2$.

The alkaloid precipitated by potassium thiocyanate is an unstable compound. Its composition has not yet been ascertained.

Physiological Action of Convallaria Majalis. Drs. Bojajawlensky and Troitzky. (*Centralblatt für Klin., Med.*, 1881, No. 1.) The observations recorded by the authors lead to the conclusion that this plant possesses properties not unlike those of foxglove, rendering it a valuable therapeutic agent in cardiac disease. It diminishes nervousness, increases the flow of urine, and causes rapid absorption of serous deposits. It never produces cumulative effects.

Tanacetum Vulgare. O. Leppig. (*Pharmaceut. Zeitschr. für Russland*, 1882, 169 and 193.) The author's examination of the flowering herb of tansy shows the presence of the following constituents:—Tanacetin, tannic acid, gallic acid, volatile oil, fatty matter, a wax-like substance, mucilage, albuminous matter, tartaric, citric, malic, and oxalic acids, a lævogyrate sugar, resin, and metarabinic acid. The bitter principle, tanacetin, is contained chiefly in the flowers; it is amorphous, and has the composition, $C_{11} H_{16} O_4$. With concentrated sulphuric acid it becomes yellow, then brown, after a short time reddish brown, and finally changing to a dark blood-red colour. The edge of the liquor becomes bounded by a narrow blue ring, which, when stirred by means of a glass rod, shows blue stripes. The tanacetum-tannic acid corresponds to the formula $C_{23} H_{29} O_{31}$; on boiling with dilute hydrochloric acid, it appears to become decomposed into sugar and catechin.

Toxic Properties of the Oil of Tanacetum Vulgare. Dr. Jowett. (*Brit. Med. Journ.*, 1881, 623.) The author, in the *Boston Medical and Surgical Journal*, reports eight cases of poisoning with this oil. The fatal dose varied from 1 to 15 drachms. Fifteen drops caused convulsions and general cyanosis, but the patient recovered. In two of the cases a decoction of the leaves produced paralysis, coma,

and death in twenty-four hours. In another an infusion of the leaves daily for a week, used also as an injection, produced peritonitis, from which the patient only recovered after the lapse of three months. These cases show that tansy is a herb possessing poisonous properties, and should not be sold indiscriminately to the public.

Sequoia Gigantea (Wellingtonia Gigantea). G. Lunge and T. Steinkauler. (*Ber. der deutsch. chem. Ges.*, xiv., 2202.) A previous report on the leaves of this plant by the same authors will be found abstracted in the *Year-Book of Pharmacy*, 1881, p. 197. In the present communication they add some further particulars respecting the constituents isolated by them. The crystalline hydrocarbon then described as *sequoiene* is found not to be identical either with fluorene, diphenylene-methane, or benzhydrolene, but to be a distinct body.

The reddish brown oil which was obtained by distillation along with the sequoiene yielded three fractions, the principal one of which is a colourless terpene, $C_{10} H_{16}$, boiling at 155° C., of a pleasant odour and acrid taste, and 0·8522 sp. gr. The second fraction is a colourless oil of 1·045 sp. gr., boiling at 227–230°, and turning the plane of polarization to the right. It has an intensely burning taste, and a strong aromatic odour, reminding of oil of turpentine. It is insoluble in water and in solution of caustic soda, but soluble in alcohol, ether, chloroform, carbon bisulphide, benzol, and glacial acetic acid. Its composition corresponds to the formula $C_{18} H_{20} O_3$. The third fraction amounts but to a very small proportion. It is a heavy yellowish oil, boiling at 280–290°, having an empyreumatic and somewhat aromatic odour, and showing the same behaviour to solvents as the previous fraction.

The terpene above described differs from all other terpenes in its optical properties; its rotatory power being $[\alpha] = + 23{\cdot}8$.

Calea Glabra. Prof. Baillon. (*Linnæa*, No. 37; *Pharm. Journ.*, 3rd series, xii., 438.) The author calls attention to the febrifuge properties of *Calea* (Caleacte) *glabra*, D. C., a plant belonging to the Compositæ, which grows in the province of St. Catherine, in Brazil. The flowering tops are used in the form of infusion. The plant is at present in the hands of a French chemist for examination of its active principle.

Some Constituents of Chelidonium Majus. L. Haitinger. (*Monatsh. für Chem.*, ii., 485.) The author's research establishes the presence of citric acid and of chelidonic acid, and confirms that of malic acid in this plant. The presence of the latter was disputed

some time ago, while at the same time it was asserted that the plant contained a new acid of the formula $C_4 H_6 O_5$. In the author's opinion, this supposed new acid was nothing but a mixture of citric and phosphoric acids.

Parthenium Integrifolium. F. B. Meyer. (*Amer. Journ. of Pharm.*, 1881, 494.) This plant, belonging to the order *Compositæ*, inhabits the central portion of the United States, growing in moist or dry soil in uncultivated fields. It is a perennial, having a large thick root, to which are attached numerous rootlets varying in size and length, some of them being four or five times as long as the main root. After drying, it is dark brown or blackish, and internally, when moistened, shows a greenish colour. The woody stem, with branches, attains a height of about three feet. The leaves are alternate, the upper ones sessile, serrate, ovate, acute, six to eight inches long below, an inch or less above. The stem terminates with numerous flowers disposed in a dense corymb. Involucre green, bell-shaped. Ray flowers five, white; heads small.

The tops of this plant having been used for several years, in some sections of Indiana, with good results, in the cure of fever and ague, the author was induced to make a chemical examination of them as far as his limited supply of material would permit. The herb yielded to petroleum benzene a dark green, waxy, slightly bitter substance, which treated with ether and water gave very bitter crystals, soluble in both liquids, and giving a beautiful deep red colour with ferric chloride. They did not reduce Fehling's solution.

The infusion of the drug, with the addition of a little spirit to preserve it, is the form in which it is used in medicine. The liquid preparations of the drug have an agreeable orange-like odour.

The Stearopten of Buchu Leaves. Prof. J. M. Maisch. (From a paper read before the Pennsylvania Pharmaceutical Association.) In a paper by Professor E. S. Wayne, of Cincinnati, published in the *Amer. Journ. Pharm.*, 1876, p. 18, some interesting experiments are related concerning two crystalline substances obtained from oil of buchu by treatment with caustic soda, and subsequent decomposition of the clear alkaline liquid with hydrochloric acid. The crystals yielded by the oil distilled from partially exhausted buchu leaves gave the reactions of salicylic acid, notably the deep purple colour with ferric chloride. The crystals, however, yielded by oil distilled from twenty pounds of buchu gave with ferric chloride a blackish colour, and the same reaction was observed by Professor

Wayne with crystals collected by W. M. Thomson. The last-mentioned crystals were separated in the cooler during the distillation of weak tincture of buchu in the preparation of fluid extract, and Professor Wayne obtained larger quantities of the same substance by distilling the nearly exhausted buchu leaves with water.

All these observations were made with short buchu leaves, presumably with the leaves of *Barosma betulina*, which for a number of years past constituted the great bulk of commercial short buchu.

Subsequently a similar case of crystallization was brought by W. M. Thomson under the author's own personal observation. In this case he found the exit end of the worm surrounded with a considerable quantity of a crystalline efflorescence, and the upper side of the pipe, as far as could be reached with the finger, covered with more perfect crystals, giving, like the inflorescence, a blackish colour with ferric chloride. This reaction was also obtained with the distillate, which was neutral to test paper. Upon examination, this substance proved to be the stearopten of buchu oil, which was recently described by Professor Flückiger as *diosphenol* (*Year-Book of Pharmacy*, 1880, 461).

At the time Professor Wayne reported his results he presented the author with samples of two crystalline substances obtained by him. One of these principles agreed in all its properties with the diosphenol of Flückiger; the other proved to be salicylic acid, as was rendered evident by the purple reaction with ferric chloride, by its melting point, which is above 150° C. = 302° F. (salicylic acid melts at 155° C. = 311° F.), and by the odour—which is similar to that of oil of wintergreen—given off on heating a little of the substance with alcohol and sulphuric acid.

Of the six samples of buchu oil in the author's possession, one was distilled from *Barosma betulina*, and all except one are at the present date over fifteen years old. Four of the oils have deposited stearopten, either in large or small crystals, which in all cases agree in properties with diosphenol. The oil of long buchu, *Barosma serratifolia*, distilled by Professor Bedford, gives with ferric salts a greenish black reaction, without the slightest tint of purple, and is therefore free from salicylic acid.

The author arrives at the conclusion that the leaves of *Barosma betulina* and of *B. serratifolia* do not contain salicylic acid, nor yield it on being subjected to distillation with water. Whether that compound may be produced from the leaves under the influence of fermentation has not been ascertained. It is not unlikely

that the presence of another kind of leaves, whether of the genus Barosma, or of some other genus or natural order, may account for the yield of salicylic acid, observed by Professor Wayne.

Notes on Liatris Odoratissima. Dr. T. F. Wood. (*New Remedies*, March 1882.) The author considers that the odorous principle of this plant is not confined to the coumarin, for after the leaves have been exhaustively treated by boiling dilute alcohol, and all the coumarin separated, the remaining extract is still distinctly odorous.

Coumarin can be separated as follows:—Boil the leaves with dilute alcohol, filter off the fluid, then pack a percolator with the same leaves, and pass enough boiling dilute alcohol through until there is but little colour obtained. Distil off the alcohol until slight iridescence appears on the surface of the liquid, then pour it off in a shallow vessel to cool. When cold, coumarin crystallizes in acicular tufts. Drain the crystals, redissolve in hot water, and recrystallize, and they become nearly white.

Several rough experimental assays of the quantity of coumarin to a given weight of leaves gives the following results:—

One pound of dried leaves one year old yielded two drachms of purified white crystals. One pound of recently collected and dried leaves yielded about two and a half drachms.

The odour of the older leaves was quite as conspicuous as that of the more recently gathered, and the discrepancy in the yield of coumarin was due to the dropping of surface crystals.

Coumarin sublimes at about a temperature of 225°. It first melts, and after the water of crystallization is driven off, the crystals are made to re-form on a cool surface.

Coumarin has a pungent, slightly bitter taste, is partially soluble in the saliva, and when swallowed in small quantities causes a glow of heat in the stomach. In five-grain doses, it quickens the pulse and causes fulness in the head.

Experiments for the production of coumarin from liatris point to the fact that it is formed during the ripening of the plant, and that it exists in exceedingly small quantities before maturity. Several attempts to procure coumarin by dry distillation of the leaves failed, although it is very likely that it can be procured in this way when a proper process has been devised.

The paper also contains a description of the botanical characters of the plant, which is omitted here owing to their having already formed the subject of abstract in previous volumes of this work.

Memecylon Tinctorium. Prof. Dragendorff. (*Pharamceut. Zeitschr. für Russland*, xxi., 232.) This plant grows in abundance on the coasts of Coromandel and elsewhere, and is chiefly used for dyeing. The author's examination of the leaves proved the absence of an alkaloid and the presence of a yellow glucoside. To the latter, which does not bear any resemblance to chrysophanic acid, the technical application of the leaves appears to be partly due, but the small amount of material at the author's disposal did not allow of closer investigation.

Rhododendron Occidentale. C. M. Troppman. (*Proc. Calif. Coll. Phar.*, 1882, 58.) The author has examined the leaves of this plant, and found them to contain an acid resin soluble in ether, a resin soluble in alcohol, chlorophyll, fat, tannin, glucose, wax, albumen, and pectin; neither arbutin nor volatile oil could be detected. Two grains of the alcoholic extract produced a burning sensation in the mouth and throat, continued cough, pain in the stomach, nausea, and flushed countenance. Ten grains given to a dog induced vomiting and purging, and seven and a half grains administered subcutaneously killed a rabbit in three hours.

Jacaranda Procera (Bignonia Copaia; Kordelestris Syphilitica; Bignonia Caroba.) Dr. Th. Peckolt. (*Zeitschr. des oest. Apoth. Ver.*, 1881, Nos. 30, 31, and *Amer. Journ. of Pharm.*, March, 1882.) This handsome little tree is known in Brazil as caroba, carobinha, caroba minda, and caroba mirim, and grows frequently in the provinces of Rio de Janeiro, Minas, and Espiviso Santo. The author has examined both the leaves and bark, with the following results, obtained from 1000 grams:—

	Leaves.	Bark.
Carobin, crystallized	1·620	3·000
Carobic Acid, crystallized	·516	—
Steocarobic Acid, crystallized	1·000	—
Carobone, balsamic resinous acid	26·666	—
Carobaretic Acid, inodorous	—	2·000
Carobaresin, inodorous, tasteless	33·334	5·000
Caroba Balsam	14·420	—
Bitter principle	2·880	2·830
Extractive	10·550	19·530
Extractive and Organic Acids	10·000	—
Caroba Tannin	4·390	4·800
Glucose	—	1·650
Chlorophyll and Wax	9·000	—
Calcium Malate	·200 }	76·100
Albumen, Starch, Dextrin, Salts	32·120 }	
Cellulose and moisture	853·304	885·090

Carobin crystallizes in felt-like, silky needles, is inodorous, has a faint alkaline and bitterish taste, infusible, insoluble in ether, readily soluble in boiling water and boiling alcohol, and is precipitated by tartar emetic and ammonium carbonate, the latter precipitate being soluble in an excess of the reagent. Tannin and metallic chlorides and iodides cause no precipitate. It is not a glucoside, does not show any striking colour reactions, and yields with acetic acid a compound crystallizing in fine needles.

Carobic acid forms stellate fusible needles of an aromatic odour and acid taste, is soluble in water and dilute alcohol, and is precipitated by the acetates of lead and copper.

Steocarobic acid is pale brown, of a tonka-like odour, of an acid and balsamic taste, and soluble in cold absolute alcohol and ether.

Carobone is greenish, amorphous, aromatic, soluble in alcohol, sp. gr. ·815, in caustic alkalies and in boiling solution of sodium carbonate.

Caroba balsam is dark drown, syrupy, agreeably aromatic, resembling tonka, and by heat may be evaporated to a nearly inodorous resin.

Caroba leaves have lanceolate, often sub-obovate leaflets, and are used in Brazil in place of sarsaparilla in cutaneous affections, and as an antisyphilitic, usually in the form of infusion, 120 grams to 1 litre, in doses of a teaspoonful three times daily. An *electuary*, known as "massa de Dr. Alves Carneiro," is composed of the powders of caroba leaves 90 grams, sarsaparilla and senna each 30 grams, calomel 2 grams, and simple syrup q.s., and is given in cutaneous syphilitic affections, in doses of a teaspoonful morning and evening, together with caroba tea.

The above analysis was completed in 1866; a manuscript in French sent to the Paris Exposition was never published; but a catalogue was published by the author in Rio in the Portuguese language in 1868. An analysis credited to C. W. Zaremba in *Phar. Centralhalle*, June 23rd, 1881, gives figures identical with the above.

The following plants are also known in Brazil as caroba :—

Jacaranda subrhombea, D.C., s. *Bignonia obovata*, Vellos., caroba preta or carob-assú; a furrowed, crisp, dark green leaf, not aromatic, apparently less efficacious.

Bignonia nodosa, Manso, caroba do campo, slightly aromatic, grows in the prairies, esteemed to be equal to true caroba.

Jacaranda oxyphylla, Cham., s. *Big. antisyphilitica*, Martius, caroba des paulistas; leaflets dark green, nearly inodorous, reputed to be also laxative: grows in the province of San Paulo.

Bignonia purgans, caroba guyra, in Amazonas; leaves used as an antisyphilitic, the root-bark as a purgative.

Sparattosperma lithontripticum, Mart., caroba branca; leaves light green, mealy, aromatic, acrid and bitter; diuretic.

Cybistax antisyphilitica, Mart., s. *Big. quinquefolia*, Vellos.; used in dysury, dropsy, chronic liver complaints, syphilitic ulcers, etc.

Heteromeles Arbutifolia. D. D. Lustig. (*Proc. Calif. Coll. Pharm.*, 1882, 59.) This plant, belonging to the natural order *Rosaceæ*, is known as laurel hawthorn, the toyon or tollon of the Indians, and grows on the coast range of California. The leaves yielded to the author hydrocyanic acid, volatile oil, tannin, gallic acid, resins, fat, wax, gum, colouring matter, and chlorophyll. The fruit is eaten by the Indians.

Jaborandi, and the Best Methods for Preparing Extract; also for Preparing its Active Principle (Pilocarpine). G. W. Kennedy. (*Chem. and Drugg.*, from a paper read at the twenty-ninth annual meeting of the American Pharmaceutical Association.) The author finds alcohol of 75 per cent. to be the best menstruum for extracting the active constituents of this drug. To make the fluid extract, he advises that for 16 troy ounces of the drug in fine powder, it be moistened with 8 fluid ounces of alcohol (of 75 per cent.), the drug packed in a percolator, and with the usual precautions; the first 14 fluid ounces are reserved, the balance of the percolate (until the drug is exhausted) is evaporated to 2 fluid ounces, and mixed with the reserved portion, making 16 fluid ounces.

To extract pilocarpine, the writer recommends that the finely-powdered jaborandi be treated by percolating it with water acidulated with 1 fluid drachm of muriatic acid to a pint of water, and obtaining not less than two parts of percolate for each part of drug used; evaporate this to a soft extractive consistence; mix with enough water to admit of filtration; add bicarbonate of soda in slight excess; and to the liquid add chloroform, in equal bulk to the filtered liquid; shake frequently during ten hours; draw off the chloroformic solution, and let it evaporate spontaneously. Redissolve the residue in chloroform, filter, and let it again evaporate spontaneously. Pilocarpine is a soft, gelatinous mass, non-crystalline, but producing with mineral acids crystallizable salts. The author gives a list of reactions with various reagents.

Symplocos Racemosa. K. L. Dey. (*Pharm. Journ.*, 3rd series, xii., 257.) This plant is a small tree of from 12 to 20 feet high, a native of Burdwan and Midnapore, in Bengal. It belongs to the natural order *Styraceæ*. Flowering time the month of December;

the seeds ripen in May. The bark is used extensively in dyeing cotton fabrics red in Bengal, and is very cheap.

The trunk is about twenty inches in circumference. The bark is somewhat rough, with a spongy, friable, exterior grey coat, inwardly of a firm, fleshy texture; when fresh of a very pale yellowish colour, and the taste mildly astringent. Leaves alternate, short-petioled, from ovate-oblong to broad-lanceolate; margins serrulate; both sides smooth, of a thick, firm texture, from 2 in. to 6 in. long, and from 1 in. to $1\frac{1}{2}$ in. broad. Stipules none. Racemes axillary and terminal, single, and generally simple, shorter than the leaves, many flowered. Flowers solitary, approximate, short peduncled; colour, lively yellow. Bracts, three to each flower, ovate, villous, one—viz., the largest—under the pedicel, and two placed opposite, at the base of the germ. Calyx superior, five-parted, permanent, segments broad-ovate, or nearly round-obtuse. Corolla one petalled, rotate; border five-parted; segments oval, deeply divided, concave, smooth, thrice the length of the calyx, or more. Filaments numerous, as long as the corolla and inserted into its base. Anthers small, two-lobed. Germ inferior, turbinate, three-celled, with from two to four ovula in each, attached to the inner and upper angles of the cells (upper end of the axis); style shorter than the stamina. Stigma three-lobed. Drupe oblong, smooth, with a beautiful purple pulp in small quantity, when ripe purple, crowned with the permanent calyx. The nut conforms to the drupe, three-celled. Seed generally solitary (with the abortive integuments of the other one or three close by its apex), linear-oblong, attached to the inside of the top of the cell. Integument tough and thick, colour of the outside light brown. Perisperm conform to the seed, rather soft. Embryo cylindric, inverse. Cotyledons small, oblong; radicle three or four times longer than cotyledons small, cylindric, superior.

In Hindu medicine this bark is known as a mild astringent, and the kavirages (native physicians) use it extensively, either in the form of a decoction or powder, in cases of bowel complaints, eye diseases, ulcers, etc.

More than three years ago the author's attention was drawn to this drug as a remedial agent in menorrhagia due to relaxation of the uterine tissue. He has given it an extensive trial in this disease, with singular success. Twenty-grain doses of the powder, mixed with sugar, twice or three times a day for three or four days, are efficacious.

Dr. T. E. Charles, Professor of Midwifery in the Medical College

of Calcutta, tried this in similar cases with the same success. The author has also used it in chyluria with remarkable success.

He is of opinion that this drug contains a peculiar combination of mild astringent substances—having a specific action on delicate relaxed mucous membranes.

Rubus Villosus. C. Johnson. (*Amer. Journ. Pharm.*, December, 1881.) This plant, belonging to the order *Rosaceæ*, is an upright, shrubby perennial, growing in rough pasture lands and thickets throughout the eastern part of the United States, from Maine to South Carolina, and is universally known as "high blackberry."

Its flowers, consisting of five white rounded petals and numerous stamens, occur upon the irregularly branched stem, in more or less elongated racemes, and produce a black multiple fruit, which ripens in August or September. The stem is longitudinally ridged, and armed with stout downward-curved prickles.

The leaves are slightly pubescent beneath, alternate, and of a darkish green colour; their general shape is ovate, with an acute apex and an unequally serrate margin. The prickles grow along the midrib and down the petiole, which is nearly the length of the leaf. All intermediate gradations are found between the single and the compound leaf of five leaflets, the five-divided being produced from the three-divided by lobes appearing upon the base, and becoming more deeply incised, so as to form a new set of leaflets.

The root varies from one-eighth of an inch in diameter to the thickness of the little finger, and contains a tough, ligneous meditullium. The bark, which is the active part, is of a grey-brown colour externally, and of a darker brown in the intermediate layer, and is slightly wrinkled. A longitudinal section of the bark shows the fibrous or bast tissue, which makes it very tough and strong, although it can be torn in the direction of the fibre with comparative ease. The transverse section presents the medullary rays and the wedge-shaped bundles of bast-tissue. The epiphlœum consists of about six or seven layers of tabular cells, and the meditullium is quite porous from the numerous ducts. The bark is found in commerce peeled from the inner woody portion.

Rubus villosus is also interesting from the fact that upon the leaves is found a minute fungus, to which Schweinitz gave the name "accidium nitens," described, in his "Synopsis Fungorum Carolinæ Superioris," as growing upon the leaves, petioles, and young branches of the entire genus. To the naked eye its appearance is that of an orange coloured rust, but when magnified one

hundred and fifty diameters, it is found to consist of a large number of roundish granular bodies, which appear about the size of a pea, and are of a light orange or sometimes a deep crimson colour. They are attached to the hairs, and are found more plentifully on the under surface of the leaves, these parts often becoming so thickly covered as to give to the plant an autumn tint, or sunburnt appearance.

By cultivation, *Rubus villosus* acquires the habits and appearance of an ornamental shrub, some of its numerous stamens becoming petals, and the flowers increasing in size; though by "trimming back" the new growing branches, the amount and size of the fruit can be greatly increased.

Tannin is the principal constituent of the root-bark. The leaves also contain this acid in a small amount, and the pleasant acidulous taste of the fruit is due to the presence of citric and malic acids.

Selinum Carvifolia. (*Journal of Botany*, May, 1882.) The paper contains a figure and description of this umbelliferous plant, which was recently found in Lincolnshire by the Rev. W. Fowler. The plant appears to have been long confounded with *Peucedanus palustre* on the Continent, which may account for its having been so long overlooked in this country. The fruit has three well-marked dorsal wings, and the lateral ones do not approach those of the opposite mericarp, as in *P. palustre.*

Adonis Vernalis. Dr. Cervello. (*Archiv für experiment. Pathol. und Pharmakol.*, xv., 235, and *Pharm. Journ.*, 3rd series, xii., 883.) The author describes some results obtained with a substance that he considers to be the active principle of the *Adonis vernalis*, and which he has named "adonidin." It is a glucoside, and is amorphous, colourless, odourless, and extremely bitter. In alcohol it is freely soluble, but only slightly so in ether and in water. In dilute hydrochloric acid it is insoluble in the cold, but when heated it splits up into sugar and a substance soluble in ether. In its physiological action, the author found adonidin to resemble digitalin in every respect, with the exception that it is far more energetic.

Silphium Laciniatum. L. J. Morris. (*Amer. Journ. of Pharm.*, 1881, 487.) This plant, also known as rosin weed, or compass plant, grows extensively westward from Ohio, between 38° to 46° north latitude. It belongs to the order *Compositæ.* The stem is usually three to six, but sometimes reaches the height of ten feet, and bears along its entire length leaves similar to the radical, but gradually becoming smaller toward the apex. The flowers, borne in a kind

of raceme at the upper part of the stem, are two to three inches broad, and, as in all other species, yellow; the scales of the involucre are ovate, tapering into long and spreading rigid points; achenia broadly winged and deeply notched. There arise from the root numerous radical leaves, which are from ten to thirty inches in length, very rough with bristly hairs, in general outline ovate, but deeply pinnately cut and parted, the divisions themselves very often cut-lobed. The root is from one to three feet in length, and one-half to two inches in diameter, and has a very rough and irregular cortical layer.

A description is given of the microscopic characters of the transverse and longitudinal sections, and illustrated by woodcuts.

An oleo-resin exudes from the stem and foliage of the plant, either spontaneously or from the puncture of insects. It congeals in small translucent, and internally transparent, light yellow tears, of varied forms, breaks with a conchoidal fracture, has an agreeable terebinthinous odour and taste, softens quickly in the mouth, and is easily masticated and kneaded between the teeth; it has the specific gravity 1·039 at 20° C., and upon incineration one gram yielded 0·005 gram or 0·5 of ash. It appears to consist of 19·66 per cent. of a hydrocarbon, probably identical in composition with oil of turpentine, and 37 per cent. of an acid resin, insoluble in alcohol, but soluble in chloroform and carbon bisulphide, and partly so in benzine and ether. It does not yield protocatechuic acid when saponified with caustic alkali.

An Adulteration of Arnica Flowers. C. Menier. (*Journ. de Pharm. et de Chim.* [5], v., 611.) The adulterant referred to consists of the flower-heads of *Inula britannica*. The flower is distinguished from arnica as follows:—The capitula are smaller, and are arranged two or three together in a loose corymb. The phyllaries are equal in length, linear, and tapering upwards. The receptacle is smooth and without hairs, the anthers are provided with two filiform appendices, the achenes are hairy and the flowers are without odour. The paler colour of the ligulate florets and the absence of aroma are the most noticeable signs of the presence of this adulteration.

Persian Insect Powder. O. Textor. (*Pharm. Journ.*, 3rd series, xii., 359.) This powder has been subjected to an examination, with the view of ascertaining its active principle, the result of previously published examinations being somewhat contradictory. Thus, Rother, in 1876, considered it to be a glucoside, which he called persicin; Semenoff, in 1876, obtained a volatile substance;

and Jousset de Bellesme, in 1876, attributed it to a crystalline alkaloid. Hanaman Roch, in 1863 ("National Dispensatory," p. 1192), ascribed the insecticidal effects to a volatile oil. The author found neither alkaloid nor volatile oil, but a soft resin soluble in benzol and alcohol, and neutral to litmus paper. It is somewhat unsatisfactory, however, to find no statement as to the composition of the powder experimented upon, whether obtained from the flowers of *Pyrethrum roseum* or *P. cinerariæfolium*, or from a commercial powder which might or might not be a mixture of white hellebore or other powders with pyrethrum. Differences in the article operated upon might explain the varying results obtained by different chemists. The author considers the action of the Persian insect powder to be directed chiefly to the alimentary canal and power of locomotion of insects, as they first eject a watery fluid, then the legs become unable to support the body, and finally the wings lose their power. Although powerless to move, the insects show signs of life for ten hours after taking the poison.

Examination of Ericaceous Plants. E. N. Smith. (An abstract of an inaugural essay. *Amer. Journ. Pharm.*, Nov., 1881.) The author has chemically examined the leaves of *Chimaphila maculata*, *Pyrola elliptica*, *P. chlorantha*, and *P. rotundifolia.* All of them were found to contain arbutin, as well as ericolin, urson, tannic, and gallic acids, also gum, sugar, albumen, a small amount of volatile oil, and some colouring matter.

Erica Vulgaris. MM. Savigny and Collineau. (*Chem. Centr.*, 1881, 703.) The authors report upon ericin, a colouring matter contained in *Erica vulgaris*, and also in the branches of various species of poplar. The intensity of this colouring matter is increased by soluble alkalies. Iron salts separate from solutions of ericin a bronze-green precipitate, tin salts a golden-yellow gum, and copper salts give a green coloration. Ericin combines readily with the aniline dyes.

Adulterated Saffron. Dr. C. Bernbeck. (*Amer. Journ. of Pharm.*, 1882, 133.) The author reports having met with saffron adulterated with *carthamus*, and with another sample in which the petals of the red poppy formed the adulterant. In this case the infusion turned grey-green with ammonia, and became bright red with nitric acid.

Bombay Mace. A. Tschirch. (*Pharmaceut. Zeitung*, 1881, No. 74.) This drug, which is occasionally found in the market, differs in several respects from ordinary mace, and appears to be obtained from a different species of *Myristica.* The lobes of the

arillus are longer and thinner than those of true mace; it is of a dark brown-red colour, and on the inside has adhering to it a thin parchment-like crumbled membrane, which is never found in true mace. The epidermal cells are radially elongated, narrow, and twice as high (those of true mace are tangentially elongated and low); their membranes show the cellulose reaction with iodine and sulphuric acid beautifully, and with zinc chloride and iodine swell and turn faintly blue. The oil cells are very numerous, located near the epidermis on both sides, often close together in groups of two or three, oval in shape, somewhat radially elongated, and contain a dark yellow, usually resinified oil, frequently also a brownish resin.

Phytolacca Dioïca. M. Ballant. (*Journ. de Pharm. et de Chim.* [5], iv., 232–234. From *Journ. Chem. Soc.*) *Phytolacca dioïca*, according to De Candolle, is indigenous to Brazil or Mexico. In Paris it is known only as a greenhouse shrub, but it flourishes on the Algerian coast. Its wood is very spongy and fibrous, and never acquires a true ligneous structure. The fruit is a fleshy, greenish yellow berry, forming grape-like clusters weighing from 30 to 40 grams. It falls off naturally about October, and is then very sweet. When pressed it yields about 74 per cent. of a thick, gummy, slightly acid syrup, with a somewhat nauseous odour. Sp. gr. = 1·100. This syrup does not ferment spontaneously, and clarifies very slowly when exposed to the air. After filtration it has a brown colour, and its dilute aqueous solution is distinctly fluorescent. The syrup contains 24·6 per cent. solid matter, which on ignition leaves 1·86 per cent. ash. It has the composition,—

Water	75·40
Chlorophyll, Wax, Resin, Essential Oil, and Volatile Acid	0·45
Sugar, reducing	3·20
Sugar, non-reducing	11·20
Organic Acid (not determined) . . .	2·60
Gum	4·40
Albuminoid Matters, Pectic Substances, and Pectose	0·89
Inorganic Salts	1·86
	100·00

The resin, which, like the essential oil to which the syrup owes its peculiar odour, exists only in very small quantity; is very bitter and is insoluble in ether. The ethereal salt of the volatile acid has an odour recalling that of ethyl butyrate. The undetermined

organic acid exists as a potassium salt, which does not crystallize, and dissolves in water, but is insoluble in ether. Its solution gives no precipitate with barium nitrate; it therefore has some of the properties of the phytolaccic acid extracted by Terreil from the fruit of *Phytolacca decandra*. The ash consists mainly of potassium carbonate, with small quantities of iron, calcium, magnesium, silica, and phosphoric acid, and traces of sulphuric acid and chlorine. No alkaloid was obtained from the syrup.

Notes on the Fruit of Strychnos Ignatii. Prof. F. A. Flückiger and A. Meyer. (*Pharm. Journ.*, 3rd series, xii., 1.) The paper contains a detailed description of this drug, accompanied by numerous woodcut illustrations, and also an interesting account of the history of the subject. As the paper is unsuited for useful abstraction, and too long for reproduction *in toto*, we must confine ourselves here to drawing the reader's attention to it by quoting the title and source of publication.

Curare. Prof. Planchon. (*Pharm. Journ.*, 3rd series, xii., 622.) In a recent memoir on the botanical origin of different varieties of curare, the author expressed an opinion that the principal constituent of the Orinoco curare was prepared from a previously undescribed species of *Strychnos*, which he named *S. Gubleri* (*Pharm. Journ.*, 3rd series, xi., 539). Some materials and information that were collected by Messrs. Crevaux and Le Jaune, during a journey last year through the Orinoco district, have, however, caused him to modify this opinion (*Journ. de Pharm. et de Chim.*, January 20, 1882), since they point to the principal constituent being derived from another plant, previously unknown, and closely allied with *Strychnos toxifera*, Benth., the plant which is the basis of the curare of British Guiana (*Pharm. Journ.*, 3rd series, xi., 754). The Orinoco plant was received without flowers; but in the more important structural characters of the wood and bark, as well as in the principal features of its branches and leaves, it closely resembles *S. toxifera*; so that although unable to affirm with absolute certainty the identity of the two plants, the author considers there are good grounds for believing that they belong to the same specific type.

The Varieties of Linseed in English Commerce. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xii., 61, 62 and 137–140.) The first part of the author's paper deals with the extent of the imports of linseed from various countries, while the principal portion is devoted to a study of the various weed-seeds occurring in different commercial samples. Certain of these weed-seeds are common to

several kinds of linseed, so that such seeds cannot be looked upon as distinctive of any one sort. There are, however, a few weed-seeds which, being derived from plants common in one country and not in another, may be regarded as characteristic. The entire absence of a seed, present in some kinds, also becomes a distinguishing feature in others. Of the various weed-seeds frequently occurring in linseed, the author gives descriptions and woodcut illustrations of the seeds of *Lolium* species, of *Polygonum lapathifolium*, *Spergula arvenis*, *Chenopodium album*, *Silene inflata*, *Camelina sativa*, *Centaurea Cyanus*, *Panicum miliare*, *Agrostemma Githago*, *Sesamum Indicum*, *Galium spurium*, and species of *Setaria*, *Sinapis* (South Russian and Indian), *Ervum* (Indian and Ionian), *Medicago* (Indian and Catanian) and Ionian *Silene*. The examination of linseed for these admixtures is important to the pharmacist, inasmuch as some of these weed-seeds impart to the meal an irritating effect when used for poultices. Besides those here named, the seeds of many other species have been occasionally observed in linseed.

Commercial linseed-oil owes its impurities not solely to the presence of foreign weed-seeds in the linseed, as it is often adulterated with resin oils and certain paraffin oils.

Kola Nuts (Gouru Nuts). MM. Heckel and Schlagdenhauffen. (*Comptes Rendus*, 1882, 802.) The authors find that this seed contains free caffeine in a proportion exceeding that contained in coffee. Besides this it contains theobromine, some fatty matter, much glucose, and a very large proportion of starch. The presence and quantity of these constituents indicate the value these seeds are likely to attain as an article of diet.

Algarobilla. W. Eitner. (*Dingl. Polyt. Journ.*, ccxliv., 80.) Algarobilla is the fruit of the *Balsamocarpum brevisolium*, a tree growing in Chili. The pericarp of this fruit is 3 to 35 cm. long, contains 40–50 per cent. of tannin, and resembles the fruits of divi, bablah, and neb-neb, used in tanning. The seeds, which amount to about 17 per cent. of the weight of the entire fruit, are dark coloured, hard, and free from tannin. Owing to the fact that the tannin exists in the algarobilla in the free state, and therefore dissolves readily in water, and the solution has a light yellow colour, this fruit forms a valuable tanning agent; but as the extract is practically a pure solution of tannin, which does not give a serviceable leather, it must be used with other tanning substances.

Note on Nigella Damascena and Nigella Sativa. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xii., 681.) The seeds of *Nigella Damascena*, as well as of some other species (*Nigella arvensis*, *in-*

dica, divaricata, fœniculacea) are used in the East much for the same purposes as those of *Nigella sativa*. The author's examination of *N. Damascena* establishes important chemical differences between this species and *N. sativa*, which are summarised in the following:—

All the samples of *N. Damascena* examined yielded fluorescent solutions with petroleum spirit, but contained no melanthin, while none of the *N. sativa* yielded a fluorescent solution, and all proved to contain melanthin. It is conceivable, in the author's opinion, that *N. sativa* may at some period, or under certain conditions, show this fluorescence; and that possibly *N. Damascena* may in some stage produce melanthin, at present only found in *N. sativa*. He hopes to settle these questions by cultivating the plants named and examining the seeds or other parts at various stages of development. So far as his present experience goes, the author is inclined to regard as doubtful the genuineness of samples of *N. sativa* seeds yielding with petroleum spirit a fluorescent solution. In such samples the seeds of *N. Damascena* may be recognised by their rounded form, their transverse furrow, and the strawberry-like odour they evolve when crushed.

Chia Seeds. H. Flowers. (*Amer. Journ. of Pharm.*, May, 1882.) The chia seed is obtained from the *Salvia hispanica*, or *Salvia chian*, a plant which grows in the northern States of Mexico, and is a species of the sage genus.

The seed is a small one, about the one-sixteenth of an inch in length, and about the one-twenty-fourth of an inch in width; it is oblong-ovate, somewhat flattish, nearly cylindrical, but both ends rounded and slightly tapering; the thinner end has a small, dark line, forming a slight projection, which is the eye of the seed, and this, when exposed to moisture, opens in a star-shaped or scalloped manner, emitting the growing embryo; below this eye are oil cells.

The seed is smooth and glossy, and is surrounded by a transparent epithelium, swelling very largely when in water. The testa is darkish—grey, striated with dark brown lines, running diagonally, and dotted, forming a very beautiful variegated surface; when pressed or crushed under a spatula it bursts at the hilum, exposing the cotyledons and the oil cells, leaving an oily stain upon the paper or other surface. Internally the testa is dark greyish brown, perfectly smooth, glossy, and devoid of the external variegations or striæ. The seed contains the embryo with the radicle pointing towards the hilum, and a white, oily, mucilaginous substance, much resembling unrendered fat.

The seed swells to about twice its natural size in water, and yields to it very readily and largely its mucilaginous properties, forming a thick solution. When treated with hot alcohol a solution is obtained which becomes cloudy on cooling, and forms white scales with globules of oil on the side of the vessel, and a clear pale yellowish bland oil at the bottom; with ether the same substances are obtained with more of the white sediment; this when treated with solution of mercury in nitric acid, acquires a reddish brown tinge. When the seeds are immersed in a weak solution of iron, they refuse to yield mucilaginous substance, and become at once surrounded with a congealed mass; the mucilage, when treated with tincture of iodine, gives no characteristic blue colour. The whitish sediment obtained from the ether solution, when mixed with potassa solution, and heated, becomes flocculent. The pale yellowish bland oil from the hot alcohol and other solutions has a taste much resembling nut oil containing a trace of flax-seed oil, which it greatly resembles both in odour and taste; when the oil is boiled long enough it becomes of a deep dark brown colour, and more marked in its similarity to that of linseed thus treated. From the author's experiments it seems probable that this oil would equal that of the flax, if not surpass it. Some of the oil left in a capsule for several days dried well, leaving a thin coating as is noticed in other oils of like nature.

The seeds are inodorous when whole, when crushed of an oily odour, and of a mucilaginous oily taste, very much like ground flax seed. The seeds are used, to quote from correspondence, to a large extent by the natives and foreigners for the preparation of a refreshing drink for the sick. This is prepared by adding a tablespoonful of the seed to a tumblerful of cold water, and after half an hour it is ready; generally it is sweetened and flavoured with orange-flower water. This mild and cooling beverage will be found very efficient in fevers, when great thirst usually troubles the invalid. Its demulcent properties are well known and highly valued by those who have used it; and the practitioner will find the chia seed a mild auxiliary and valuable emollient, superior to flax seed.

When a mild injection is required, and in the earlier stages of venereal diseases, it is often advantageous, and proves of invaluable service in forming a vehicle. The mucilage will also be found of great benefit in throat affections as a gargle or wash, as it will tend to protect the inflamed parts from the miasmatic influence of the air when respiring, and it has been, and is now used, in ophthalmia.

The mucilage should not be allowed to stand in open vessels longer than five or six days, as a thick whitish mould-like collection forms on top, and in preparing the drinks it will be found much preferable to renew each day.

The paper is supplemented by a long account of the history of this drug by Prof. Maisch in the same number of the *American Journal of Pharmacy*.

Abrus Precatorius. C. J. H. Warden. (*Chemists' Journal*, March 3; *Amer. Journ. of Pharm.*, 1882, 251.) The seeds of this plant, which weigh on an average $2\frac{3}{16}$ gr., are poisonous. The author did not succeed in isolating the poisonous principle, but obtained a white crystalline acid and an oil. *Abric acid* was obtained by exhausting the seeds with boiling alcohol; its formula appears to be $C_2H_{24}N_3O$; it is slightly soluble in cold, but dissolves in boiling water, crystallizing on cooling, and with bases forms well-defined crystalline salts. The physiological experiments gave the following results:—

The mixture of half a seed with cold water, injected into a cat's thigh, produced fatal effects in from eighteen to thirty hours. No effects were apparent for eight or ten hours; then a gradual disinclination to move supervened, which slowly increased until the animal was unable to move; the respiration became shallower, the animal remained on its side, and slowly died. No convulsive movements, diarrhœa, or vomiting were observed.

The extract made with boiling alcohol was inert.

The residue, extracted with boiling alcohol, had no effect.

Abric acid and ammonium abrate are inert.

Neither the aqueous distillate of the seeds, nor the residue left in the retort, produced any symptoms.

The extract made with cold alcohol, by spontaneous evaporation, produced no effects.

The ethereal extract produced fatal effects with the usual symptoms; in a second experiment no effects were produced.

It would appear that the temperature of 100° C. destroys the activity of the poison.

The Fruit of Sambucus Canadensis. J. B. Metzger. (*Amer. Journ. of Pharm.*, 1881, 553.) The author's partial analysis of this drug shows the presence of sugar, gum, tannin, fat, and a resinous substance.

Phytolacca Dioica. M. Balland. (*Journ. de Pharm. et de Chim.*, 1881, 232.) This plant is indigenous to Brazil or Mexico, and has been naturalized in Algeria, where trees may be seen

having a height of seven or eight metres, and trunks of two to three metres in circumference, having a spongy wood. The berries grow in racemes, are yellowish green, weigh about one gram, and are twelve to fifteen-celled, each cell containing a flattened seed, enclosing a cylindrical embryo, curved around the endosperm. According to the author, the berries, which are sweet and edible, yield by expression seventy-four per cent. of juice, which, after filtration, is brown, and one hundred parts of this were found to contain of chlorophyll, wax, resin, volatile oil, and volatile acid, ·45 part; glucose, 3·20; saccharose, 11·20; undetermined organic acid, 2·60; gum, 4·40; albuminoids and pectin compounds, ·89; ash, 1·86; and water, 75·40 parts.

The resin is soluble in ether and very acrid, but is present only in minute quantity, like the volatile oil. The volatile acid has an agreeable odour, resembling that of butyric acid.

Euphorbia Lathyris. E. Sudour and A. Caraven-Cachin. (*Répert. de Pharm.*, 1881, 526, and *Amer. Journ. of Pharm.*, 1882, 72.) The authors, having observed the effects of the seeds, state that they act as a drastic purgative, and contain the active principle in very variable proportion. An emetic effect always precedes the purgative action, even if the dose be small, and may manifest itself in forty-five minutes, or may be retarded for three hours. The seeds have an irritating action upon the mucous membrane of the digestive canal, principally in the larger intestines and in the back-throat, if mastication has been sufficiently prolonged. The toxic effects, produced by large doses, may be divided into three periods: 1, the cold stage (vomiting, diarrhœa); 2, the stage of excitation (nervous affects, vertigo, delirium); 3, the stage of reaction (heat, abundant sweating). Opiates are the best and most prompt remedies against these effects. In doses of six to twelve seeds, which are recommended in several works, violent gastro-intestinal irritation may be produced. The drug being very active, and frequently variable, should not be employed in medicine.

Leptomeria Acida. E. H. Rennie. (*Journ. Chem. Soc.*, 1881, 1033.) The fruit of *Leptomeria acida*, or Australian currant, owes its intensely sour taste chiefly to malic acid, which, besides small quantities of citric and tartaric acids, is present to the amount of more than 40 per cent. in the residue obtained by neutralising the juice with sodium carbonate and evaporating to dryness. The ash contains a considerable quantity of potassium carbonate, with mere traces of calcium carbonate.

The Seeds of Brassica Rapa. H. Ritthausen. (*Pharmaceut.*

Zeitung, 1881, 645.) The author found these seeds to contain myronate of potassium and to yield oil of mustard, whilst the seeds of *Brassica napus* did not yield a trace of this oil, and proved to be quite free from myronic acid.

Pumpkin Seeds. Dr. G. Grübler. (*Journ. für pract. Chem.*, 1881, No. 3.) These seeds contain a crystallizable albumen, obtainable from them in the form of well defined octahedra. These crystals contain a larger proportion of carbon, nitrogen, and sulphur than amorphous albumen.

Cucurbita Maxima. C. S. von Cadenberg. (*Pharm. Centralhalle*, 1881, 261.) The author obtained from the seeds of this plant, by pressure, nearly 25 per cent. of a yellowish fixed oil of a sweet taste, which proved an efficient remedy for tapeworm in a number of cases. The dose administered was twenty grams, followed by forty-five grams of castor oil after four hours. The fresh seeds of *Cucumis sativus*, which are rich in oil and mucilage, likewise possess tænifuge properties.

Asclepias Syriaca. Dr. C. Spurway. (*Brit. Med. Journ.*) The author calls attention to the efficacy of the American milkweed, *Asclepias Syriaca*, in some forms of dropsy, especially in cases of cardiac dropsy connected with mitral disease.

Constituents of Viccia Cracca. P. Baessler. (*Landw. Versuchs.-Stat.*, xxvii., 415.) The air-dried plants of *Viccia cracca*, the wild vetch, were found to contain 15·6 per cent. of water, 5·76 per cent. of ash, and 78·64 per cent. of organic matter. The analysis of plants dried at 100° C. gave the following results :—

Ash	6·83 per cent.
Albumen	27·37 ,,
Cellulose	19·99 ,,
Fat	1·43 ,,
Extractive matters . . .	44·38 ,,

The ash contains 37 per cent. of potash, and about 10 per cent of phosphoric acid ($P_2 O_5$).

Erigeron Canadense. F. Vigier and C. Cloez. (*Journ. de Pharm. et de Chim.* [5], iv., 236 and 333.) This plant grows abundantly in the mint fields of America. Its essential oil, according to the authors, occurs very frequently as an impurity in American peppermint oil, in which it may be detected by means of the following reactions: Oil of erigeron is not saponified by potash, but is coloured orange-red; when it is heated the colour darkens, and the oil is partly converted into a reddish purple viscous mass. With the freshly distilled oil, this reaction is not

well marked, but it readily takes place with the slightly oxidized substance. Essence of peppermint does not give this reaction, but forms, with the alkali, a white emulsion, which, when heated, acquires a clear pale yellow colour. Oil of erigeron is completely insoluble in alcohol of 85° at 15°, whereas essence of peppermint readily dissolves. When a mixture of the two oils is agitated with an equal volume of alcohol of 85°, it becomes milky, and after twenty-four hours the insoluble oil separates out. In this way 8–10 per cent. of oil of erigeron may be detected in essence of peppermint. Essence of *Eucalyptus globulus* and essence of turpentine behave in the same way. Oil of erigeron is a valuable remedy in all forms of hæmorrhage, in diarrhœa, dysentery, and the intestinal hæmorrhage in typhoid fever.

Reaction of Oil of Peppermint. (*Archiv der Pharm.*, 1881, 428.) Flückiger observed that oil of peppermint acquires a blue-green colour with nitric acid, sp. gr. 1·2. In 1878 A. Schack observed that an alcoholic solution of the oil will gradually acquire a copper-green colour in the presence of salicylic acid. On adding the oil to melted salicylic acid, a blue-green mass is at once produced, soluble in alcohol. All acids experimented with, including carbolic acid, but not carbonic acid under ordinary pressure, give a similar reaction, particularly in the presence of alcohol, application of a moderate heat being necessary in some cases. A mixture of 1 c.c. glacial acetic acid and one drop of oil of peppermint, slightly warmed, shows the colour very beautifully, it being blue in transmitted and blood-red in reflected light, and after diluting with alcohol until the blue tint has nearly disappeared, the red reflection is still observed in the sunlight on pouring the liquid out in a thin stream, and looking vertically into it. Menthol and oil of crisped mint do not show the reaction.

Note on Oil of Male Fern. E. Dietrich. (*New Remedies*, 1882, 215.) According to the author, the frequent failure of oleoresin of male fern as a remedy against tape-worm is to be ascribed to its irrational administration. It has become known that the popular "worm-doctors," who use almost exclusively the oleoresin of male fern, and who hardly ever meet with a failure, administer the remedy in conjunction with castor oil, instead of following it by the oil after one or two hours, as is usually done by practitioners. The object is to bring the extract, in an unaltered or undigested condition, in contact with the worm. The experiments which have been made by mixing one part of the oleoresin with two parts of castor oil have been very successful, and this mode of administration

deserves, therefore, the preference. Oleoresin of male fern is apt to derange the stomach, and when enveloped partly in the oil, is likely to pass it more rapidly, which constitutes another advantage. The unpleasant taste of the mixture may be disguised by filling it in capsules of about 3 grams (45 grains) each. The dose may be regulated from six capsules (equal to six grams or 90 grains of the oleoresin, and 12 grams of castor oil) to seven or eight more, according to circumstances. It is advisable to empty the bowels on the preceding day by a mild purgative, best by castor oil.

Chaulmoogra Oil and Gynocardic Acid. Dr. Wyndham Cottle. (*Chem. and Drugg.*, 1881, 295.) The author writes to the *British Medical Journal* on chaulmoogra oil and its active principle, gynocardic acid, as internal and external remedies in various forms of skin diseases. Gynocardic acid he finds preferable for several reasons, as it rarely produces nausea, can easily be given in the form of pills, and is more uniform. Both the oil and the gynocardic acid are used either as external or internal remedies, the oil being best taken in perles; and the oil and the acid best applied as ointments in combination with vaseline. Dr. Cottle seems to have found the medicines most serviceable as local applications in eczema. In eczema of the face, and when it shows itself in dry patches, he has found an ointment of gynocardic acid of from 15 to 25 grains to the ounce of vaseline almost a specific, when most of the ordinary applications in use only served to aggravate the local mischief. The ointment should be applied three or four times daily, so as to keep the affected parts lubricated with it. Again, in eczema of the hands, such an ointment is the most generally useful application with which he is acquainted. In the acute form of this disease, or where there is much discharge, the good effects following the use of chaulmoogra oil or gynocardic acid locally applied are not so marked. For internal administration it is well to begin with about 4 minims of the oil, or $\frac{1}{2}$ grain of the acid, taken after food twice or thrice daily, and gradually increased from $\frac{1}{2}$ drachm to 1 drachm of the oil, or 1 to 3 grains of the acid. An aperient should be given at the same time if necessary. The oil may be enclosed in perles, or given in emulsion. It is convenient to have the gynocardic acid made into pills containing $\frac{1}{2}$ grain of the acid, with 3 grains of extract of gentian, extract of hops, or conserve of roses. To commence, one such pill may be given thrice daily. The amount may be gradually increased to three or four pills for each dose. The writer adds that the constitutional effects of the drug may be produced by inunction, and he suggests that a soap in which gyno-

cardic acid was incorporated would probably possess much of the soothing and remedial influence of the gynocardic acid, and prove useful in the treatment of many forms of skin disease.

Test for Distinguishing Cotton-seed Oil from Olive Oil. M. Zecchini. (*Gazzetta Chim. Ital.*, 1882, 61. From *Journ. Chem. Soc.*) The author recommends for this purpose pure colourless nitric acid, free from nitrous products, and having a density of 1·40. Acid of this strength forms with pure olive oil at first a colourless or slightly straw-coloured mixture, changing to light dove-grey with yellowish reflex; whereas with cotton-seed oil it forms at first a golden yellow mixture, afterwards changing to a coffee-brown colour, so deep as to be almost black. To apply the test, the two liquids are mixed in a test-tube closed with a caoutchouc stopper, and shaken together briskly for about half a minute, the tube being then left to rest in a vertical position for five or six minutes. This method serves for the detection of 0·5 per cent., cotton-seed oil in olive oil. It is essential to use acid of the strength above mentioned, for weaker acid, *e.g.*, of sp. gr. 1·22 to 1·33, produces with cotton-seed oil only a light coloured liquid, scarcely distinguishable from that formed with olive oil; while on the other hand, strong acid having a sp. gr. of 1·40, and charged with nitrous products, gives a dark colour even with pure olive oil.

Detection of Adulterants in Olive Oil. (*Analyst*, Dec., 1881.) Beetroot oil contains sulphur, and saponifying the oil with an alcoholic solution of caustic potash will bring out the sulphurous acid. Sesame oil can be found by adding a little muriatic acid to a small piece of sugar, and shaking these along with some of the oil, the sesame oil will be recognised by its red colour.

Cotton-seed Oil. M. Wideman. (*Moniteur Scient.*, May, 1882.) Cotton-seed oil at 0° has the sp. gr. 0·9406, at 30° it is only 0·9206. With oil of vitriol it takes a violet tint, which increases on stirring. At the end of twenty-four hours the mixture becomes thick and deep brown. With sulphuric acid and potassium bichromate there is a violet reaction; sulphurous acid is evolved, and the oil takes a blood-red colour. At the end of twenty-four hours it has becomes a black solid mass. With caustic alkalies (sp. gr. 1·24), the oil thickens, becomes a straw-yellow, while the alkaline solution separates, and takes a deeper colour. If the mixture is stirred with a glass rod, the upper layers take a blue colour, which gradually passes into a violet.

Oil of Anda-Assu. (*New Remedies*, Sept., 1881.) *Johannesia princeps*, Vell. (*Anda Gomesii*, Juss, *Anda brasiliensis*, Radd.,

Andicus pentaphyllus, Vell.), is a large tree of Brazil, belonging to the natural family *Euphorbiaceæ*, growing along the coast on sandy soil, but also much cultivated in the interior. It has numerous spreading branches, digitate leaves, with five entire oval-lanceolate leaflets, each with a petiole, and all attached to a common petiole having from two to five glands at the point of insertion of the leaves. The flowers are pale yellow, in irregular terminal panicles, the male flowers are on stalks, the female sessile. The fruit is a nut over three inches in diameter, almost heart-shaped, or indistinctly four cornered. The kernel is oval, somewhat compressed, with two prominent and two rather indistinct corners. Martius states that the shape of the nuts as they appear in the market, is so different that probably several species are the sources of them. The seeds, of which there are two, seldom three, are about the size of a small plum, somewhat kidney-shaped and covered with a firm dark brown epidermis. They have an agreeable almond-like, or hazel-nut-like flavour, and contain a fatty oil.

These seeds are known in Brazil under the following names: *andá-acú, andá-guacú, indaiacú, indayucú, purga de gentio* (in Rio de Janeiro and S. Paulo), *coco de purga, purgo dos Paulistas, fruta de arárá* (in Minas). They have been used from ancient times as an effective purgative, and have particularly been found useful, even by European practitioners in Brazil, in affections of the liver, jaundice, and dropsy. They have also been found valuable as auxiliary remedies in menstrual disturbances and in scrofulous affections.

The ordinary dose for a male adult is two seeds, which may be increased to three, or even more with caution. They are best administered in form of emulsion, or combined with starch or sugar, and mild aromatics, whereby their effect is rendered less harsh, and the tendency to vomiting, which sometimes occurs, is diminished. The oil of the seeds is also used as a purgative, but it is much less effective than the seeds themselves; an ordinary dose is about forty drops. It is also used for burning in lamps, and has the peculiar property of being a very rapidly drying oil, for which reason it is much sought after by painters and artists. The shell of the fruit is astringent, and is sometimes used for stupefying fish. After being roasted it is held to be a sovereign remedy in diarrhœa brought on by cold and exposure.

By expressing fifty seeds of johannesia, which weigh about 350 grams, about 48 grams of a fine, clear, slighty yellowish, odourless oil are obtained. Its taste is at first somewhat nauseating, after-

wards saccharine. It is soluble in ether, oil of turpentine, and benzin, solidifies at 8° C., and has a specific gravity of 0·9176 at 18° C.

An analysis of the fruits or seeds of Johannesia has revealed the presence of 0·4 per cent. of an active principle which the discoverer Mello Olliveira, proposes to call *johannesine.* It was obtained in the following manner: 100 grams of the seeds, in coarse powder, are treated with water slightly acidulated with hydrochloric acid, at a temperature of 80° C., during three hours. The mixture is set aside for twenty-four hours and filtered, when a clear dark red liquid is obtained. This is treated with ammonia, which produces an abundant precipitate. The latter is washed first with water, then with hot alcohol, and after being dried, it is a light rose-coloured powder, very light and completely soluble in acidulated water. The colouring matter accompanying the principle may be removed either by repeated crystallization of one of its salts, or else by filtering the aqueous solution through animal charcoal. The pure alkaloid is but little soluble in water or alcohol, and is insoluble in chloroform, benzin, ether, and disulphide of carbon. Dr. Couty found the sulphate of johannesine, contrary to the opinions of other Brazilian physicians, to be totally inert.

Dr. Jorves (*Monit. de la Pharm.*, 1881, 26), of Rio de Janeiro, obtained very satisfactory results with the oil in 1860, having used it in a case of cirrhosis with dropsy, in the dose of two teaspoonfuls in a cup of coffee. Dr. Fazenda also obtained very good results. Not long ago, Dr. Joao Mansel de Castro studied the effects of the oil very closely, and arrived at the following results:—

1. Oil of anda-assu may be administered in doses of 10 grams at a time without producing vomiting.

2. The purgative effect appears two or three hours after taking the oil.

3. There are usually three or four evacuations after one dose.

4. No intestinal irritation follows the use of the oil.

5. It may be employed in all cases where castor oil would be used.

6. It has the following advantages over castor oil: it produces the same degree of effect with a smaller dose, and it has not the repulsive odour of castor oil.

Other authorities also regard it as a great advantage that it is much more fluid, and therefore does not adhere so much to the palate. Besides, the seed of anda-assu is very abundant in Brazil, and it furnishes a great deal of oil, being about ten times as large as a castor oil bean.

If the oil is employed in larger doses than 10 grams, it acts as a drastic cathartic. A griping principle seems to reside in the embryo and the skin of the seed, both of these should, therefore, be removed when making an emulsion of the seeds.

Drugs of the Argentine Republic. (*Pharm. Journ.*, 3rd series, xii., 119.) Messrs. Gehe, of Dresden, report having received from the Argentine Republic specimens of the bark, leaves, fruit, etc., of a number of plants used in that country as popular remedies, and furnish a description of the same. "Durazuillo" (*Cestrum pseudoquina*, Mart.: Solanaceæ): leaves and root-bark much used in fevers and bowel complaints. "Chucu" (*Nierembergia hippomanica*, Miers: Solanaceæ): produces cold fever in animals eating it; and *Zanthoxylum Coco* (Rutaceæ) used as a remedy for the effects of "chucu." "Chanar" (*Gourliea decorticans*, Gill.: Leguminosæ): fruit used in disorders of chest and lungs; the bark used by midwives. *Zizyphus Mistol*, Griseb.: fruit a powerful diuretic. "Piquillin" (*Condalia lineata*, Griseb.: Rhamnaceæ): used as a laxative, especially for children. *Celtis Tala*, Gill. (Urticaceæ): infusion of leaves used in affections of the chest. *Martynia montevidiensis*, Cham. (Gesneraceæ): seeds used in affections of the eye. *Prosopis Tintitaco* (Leguminosæ): fruit diuretic. "Topas Aire" (Compositæ): used in affections of the eye.

Iodine-yielding Algæ. A Proposal for their more direct Use in Pharmacy. J. Wheeler. (Read before the Pharmaceutical Society, Feb. 1st, 1882. From *Pharm. Journ.*, 3rd series, xii., 642.) Comparative determinations of iodine in a number of different *Algæ* have convinced the author that the *Laminaria* stands foremost with regard to the proportion of this element, and that it greatly exceeds *Fucus vesiculosus* in this respect. He therefore pleads in favour of the introduction of this genus into the Materia Medica, and publishes the following notes and formula as embodying the results of his investigation :—

Laminaria Cloustoni.—The fronds of this yield a decoction rich in iodine, though perhaps in somewhat less measure than *L. flexicaulis*. The writer is unable to suggest any particular employment for which it should be preferred to the other members of the genus. From the facility, however, with which its fronds are powdered, it would afford a cheap and possibly useful ingredient in a resolvent poultice, or—on paper after the manner of charta sinapis, or some more flexible material after the fashion of the popular porous plasters—supply on soaking in water a convenient application to scrofulous joints, etc.

Laminaria flexicaulis.—This doubtless is the richest of all algæ in iodine, which it yields from the fronds in larger percentage than either the stem or root. Maceration with water or proof spirit is found to extract its iodides. Sea-water, also, whether of normal density or concentrated down to 5 volumes in 1, serves equally as a menstruum, and offers, in addition to its possibly enhanced therapeutic quality, the property of keeping well. It is possible the profession may one day find a varied employment for the presumably useful therapeutic properties of this species.

The writer suggests the following formulæ for its employment:—

Infusion of Laminaria flexicaulis.

Take of dried and sliced fronds . .	1 part.
Water	10 parts.

Macerate, with an occasional stirring, for four hours, and strain without pressure.

Tincture of Laminaria flexicaulis.

Take of dried and sliced fronds . .	1 part.
Proof Spirit	8 parts.

Macerate seven days, and strain.

Laminaria saccharina is of more complex character than either of the preceding, yielding to decoction 50 per cent. of its weight, and affording iodine, bromine, and mannite, the latter shown by Stenhouse to amount to 12 or 15 per cent. of the plant, and a mucilage which in the experience of the writer differs materially from that afforded by any other species. Its emulsifying power has already been alluded to. *Chondrus crispus* will, by virtue of its glutinous quality, give a pseudo-emulsion with cod-liver oil, differing optically, however, from the more minute division and permanent separation of the oil particles effected by *Laminaria saccharina.* It moreover fails in keeping quality, and obviously lacks the therapeutic credentials of the above.

The writer supposes that the chief use of this species will lie in the preparation of cod-liver oil emulsion, for which purpose he submits the following formulæ:—

Decoction of Laminaria saccharina.

Take of dried and sliced fronds . .	1 part.
Water	10 parts.

Macerate for four hours with occasional stirring, then heat gradually to boiling, which continue until its viscosity is discharged.

By evaporation it can be reduced to the consistence of an extract, or so dried as to yield a horny, translucent mass, in either of which conditions, however, it has not the emulsifying power of an equivalent of fresh decoction. The following is the author's formula :—

Cod-liver Oil Emulsion.

Take of Cod-liver Oil	10 parts.
Glycerin	1 part.
Cold decoction of Laminaria sacch. .	9 parts.

Put into a bottle of suitable size, and mix by agitation. To the liquid may be added some small proportion of essential oil, for which purpose the author is accustomed to employ oil of eucalyptus. This emulsion has been subjected to some crucial tests, and is found to keep well; its flavour is unobjectionable. It presents the oil in a condition easy of amalgamation with the food contained in the stomach, and thus may doubtless favour its more ready digestion and ultimate assimilation.

Pulque. Dr. E. E. Riopel. (*Therap. Gazz.*, 1881.) Pulque is the national drink of the Mexicans. It is produced by the fermentation of the maguey, or *Agave Americana.* This plant has been considered diuretic and antisyphilitic. There is no authentic record as to who first made pulque or neutli. It seems, however, to be the general belief that it was Xochitl, daughter of a nobleman, called Papantezin, who lived in the time of Tapancaltzin, eighth king of the Toltecs. From time immemorial pulque has been considered to contain medicinal virtues in a very high degree, as well as all the other products of the maguey, and at one time the maguey was even said to hold a spiritual life, and was held in reverence. To-day pulque is esteemed by the ignorant classes as having a variety of curative powers, and physicians use it for its alcoholic and nutritive properties. It is held as a stimulant, tonic, and antispasmodic. They recommend it to the infirm, weak, anæmic and nursing mothers.

It is obtained by fermenting the juice expressed from the central portion of the maguey plant. After expressing the juice between rollers, or, as was formerly done, by means of suction, it is carried to the vats for fermentation. These vats consist of raw ox-hides loosely suspended in a strong wooden frame, with the hair on the outside. These hide-made vessels contain the cryptococcus or fer-

ment, which is a residuum of the former fermentations. After a few hours fermentation is fully established, and the pulque is drawn off, always leaving a residuum in the vessel for the next fermentation. The liquid obtained from the maguey plant has a density varying from 1·029 to 1·042, and contains in 100 parts 9·553 of sugar, 0·540 of gum and soluble albumen, 0·726 salts, and 89·181 of water holding in solution resinous matter, fats, albuminoids, starch, dextrine, and glucose.

According to Don Jose Ramos, its ash contains potash, soda, and lime in moderate proportions, and magnesia and alumina as chlorides, carbonates, sulphates, and silicates; hence the great value in which it must have been held in former times, and in which it ought to be held at the present day.

Extractum Krameriæ. Prof. E. A. Van der Burg. (*N. Tydschr. voor Phar.*, Oct., 1881.) The author has made a number of experiments with the view of determining the causes of the different behaviour of commercial extract of rhatany. The Peruvian root, exhausted by cold water, yielded 10·5 per cent., and by decoction 18·5 per cent. of extract, while Savanilla rhatany gave 14·75 and 20·50 per cent. Of these extracts, that of the Peruvian root, prepared with cold water and by evaporation *in vacuo*, was of a light red colour (not brown), readily and completely soluble in water, had the strongest astringent taste, and gave the strongest reactions for tannin; a one per cent. solution yielded with lead acetate a nearly white, slightly rose-coloured precipitate, with ammonia a bright blood-red colour, and with lime water a light red precipitate. The corresponding reactions with the other extracts were mostly much darker, as were also the precipitates with cinchonine sulphate and with tincture of iodine. For the preparation of *syrupus iodotannicus*, 0·1 gram iodine was dissolved in 2 c.c. alcohol, of sp. gr. ·828, and the solution mixed with 0·4 gram of extract, previously triturated with 4 c.c. water; with the extract prepared by cold water and evaporation *in vacuo*, the action of free iodine had completely ceased in twenty-four hours, while it was still evident with all the other extracts after six weeks, evidently due to the decomposition of a portion of the tannin during the preparation.

No characteristic difference could be observed between the extracts prepared from the cold infusion by evaporation at the ordinary temperature, in the water-bath or over the naked fire; nor between the extracts prepared from decoctions of the root and evaporated in the manner indicated; the latter extracts were invariably dark in colour, and with reagents yielded the darkest coloured reactions. The

Savanilla extracts were always darker than the corresponding extracts from Peruvian rhatany. Commercial *extractum krameriæ americanum* agreed in all respects with the extract obtained from Savanilla rhatany with cold water; but the commercial rhatany extract "in lamellis" differed to such an extent from all extracts prepared from Peruvian and Savanilla rhatany, as to warrant the inference of its being prepared from an entirely different drug; it has no astringent taste, is but slightly soluble in strong alcohol, its aqueous solution yields a considerable precipitate with alcohol, and the precipitates with all reagents had a colour differing materially from the precipitates obtained with the other extracts.

Note on Extract of Aconite. E. L. Cleaver, and M. W. Williams. (From a paper read before the Pharmaceutical Society, March, 1882, and published in the *Pharm. Journ.*, 3rd series, xii., 722.) The fact that some commercial specimens of extract of aconite, when chewed, fail to produce the characteristic tingling and subsequent numbness on the tongue and lips, while all parts of *Aconitum Napellus* invariably produce this effect, has induced the authors to make a comparative examination of extracts of *A. Napellus* and *A. paniculatum*.

The extracts differed considerably in appearance and taste. That from *A. paniculatum* was firm, dark green, and had a slightly bitter taste, but without any of the peculiar after-effects produced by the extract of *A. Napellus*.

The latter was dark brown and much more hygroscopic, and was totally unlike a green extract of the B. P. It produced, when a small quantity was taken, the characteristic tingling, etc.

The "paniculatum" extract was examined as follows:—

It was rubbed down with water to a smooth paste, and strong alcohol added, and allowed to macerate, with frequent shaking, for some days.

The liquid was filtered and evaporated, and the residue treated with a very small quantity of dilute acid. The liquid was then made alkaline and treated with ether, from which the alkaloid was recovered in the usual manner. It yielded about three per cent. of a non-crystalline substance, giving alkaloidal reactions and having a very bitter taste. The quantity, however, was too small for identification.

The uncrystallized substance was totally free from aconitine, as indicated by the absence of tingling produced when tasted.

112 pounds of fresh herb was divided into flowers, stem, leaves, and when dried yielded twenty-two pounds of stem, eight pounds

of leaves, and three ounces flowers. Each of these was examined separately, as follows :—

Maceration with strong alcohol, and subsequently with acidulated water. The alcohol was distilled, and the residue washed with dilute acid, alkalized, and treated with ether. From the ether the alkaloid was recovered and purified.

In each case the alkaloidal substance produced was apparently the same, having a bitter taste, but without the pungency characteristic of the active aconite bases.

The amount of alkaloid contained in the various parts of the dry plant was as follows :—

Flowers	·9 per cent.
Leaves	·1 „
Stem	
Extract	·3 „

The relatively large quantity of alkaloid in the flowers will be at once noticed, and this fact alone may prove of great value in succeeding work on the alkaloids of plants.

The authors intend to make an examination of the root of *A. paniculatum* as soon as they can get a supply, and then to report further upon the nature of the alkaloid of this genus.

The Relative Activity of Aconitines from different Commercial Sources. Prof. P. C. Plugge. (*Archiv der Pharm.*, Jan., 1882.) A case of accidental poisoning by aconitine, which was brought under the author's notice, caused him to investigate the relative toxic action of different kinds of aconitine, with the object of throwing light upon the case in question. His results lead to the following conclusions :—

1. Petit's nitrate of aconitine has a poisonous action at least eight times stronger than that of Merck's, and one hundred and seventy times stronger than that of Friedländer's.

2. Merck's nitrate of aconitine has a poisonous action at least twenty to thirty times stronger than that of Friedländer's.

It also appears from the foregoing, that the preparations known as "German aconitine" are not always of the same strength, there being a much greater difference between the two German preparations examined than between the more powerful of the two and the French preparation.

In view of these facts, the author emphasises the necessity that physicians should exercise the greatest care in prescribing aconitine and its salts, as the dispensing of a different preparation from that

intended by the prescriber may lead to the administration of a fatal dose, as in the case reported upon by the author, where instead of Friedländer's preparation, which was intended but not specified by the prescriber, that of Petit, which was one hundred and seventy times stronger, was used. The author also recommends that the official maximum dose in the Dutch Pharmacopœia, of four milligrams, or of thirty-two milligrams per day, should be struck out, as in this case it proved fatal.

The Yield of Aconitine from Aconite Root according to different Processes. C. Schneider (*New Remedies*, 1882, 145., from *Archiv der Pharm.*, ccxix., No. 5.) The author has tried different processes to ascertain the comparative yield of alkaloid. The process of the British Pharmacopœia yielded only 0·002 per cent., or one part of alkaloid from 50,000 parts of aconite. Morton's process (*Buchner's Commentar zur Ph. Germ.*, 1874) gave 0·127 per cent. of a light yellow powder. Hirzel's process yielded 0·0046 per cent. (*Vorträge über Pharmacie*, Leipzig). Wittstein's process (*Anleitung zur Darst.*, etc.,) gave 0·14 per cent., in well-formed, isolated, six-sided tablets. Hottot and Liégois' process (*Dorvault's Officine*, approaching in its main features that of the U.S. Ph.) yielded 0·296 per cent. of crystals. Duquesnel's process (*Jahresbericht der Pharm.*, 1872) gave 0·339 per cent. of well-developed crystals.

The good results of the last-named process are ascribed to the fact that Duquesnel's extract is made with 90 per cent. alcohol containing one per cent. of tartaric acid by cold percolation, while all the others use more or less heat, some with and others without sulphuric acid.

The Extraction of Fat from Nux Vomica. T. E. Greenish. (*Pharm. Journ.*, 3rd series, xii., 581.) Halberg has recommended the removal of fat from nux vomica by means of petroleum ether as a preliminary step in the preparation of the extract, and has stated that this solvent does not remove any portion of the alkaloids. The author, however, finds that this process of purification involves the loss of as much as one-sixth of the total amount of alkaloids present, and should therefore not be applied. No such loss, however, occurs if coal-tar benzol be used instead of petroleum spirit; and for this reason the author recommends the removal of the fat by percolation with the former as a safe operation.

The Physiological Action of Homatropine Hydrobromate. Prof. F. B. Power. (*Amer. Journ. of Pharm.*, 1882, 148.) The author's observations lead to the following conclusions:—

1. That homatropine hydrobromate in solutions of two, four,

and six grains to the ounce is competent to paralyse the accommodation.

2. That in from sixteen to thirty hours this paralysis entirely disappears.

3. That dilation of the pupil accompanies the paralysis, and is more persistent, the probable duration being forty-eight hours.

4. That it is no more liable to produce conjunctival irritation than atropine or duboisine.

5. That it produces far less constitutional disturbance than either of the old mydriatics.

Physiological Effects of Aspidospermine. Dr. G. Gutmann. (*Chem. and Drugg.*, 1881, 529.) The author has conducted several experiments to ascertain the pharmacological properties of several aspidospermine preparations, and gives in the *Archiv für Experimentelle Pathologie und Pharmakologie*, November 8th, 1881, the following results of his researches:—

1. Aspidospermine has a poisonous effect on the organs of respiration and circulation of both warm and cold-blooded animals.

2. In the case of cold-blooded animals paralysis of the respiratory organs, accompanied by a weakening of the heart's action, is produced, and leads to a fatal termination.

3. In the case of warm-blooded animals the heart is first affected, followed by a considerable weakening of the pulse, a reduction of the temperature of the body, sometimes very considerable, in most cases accompanied by a gradual dyspnœa. Death ensues from paralysis of the heart.

Physiological Experiments with Chrysarobin. Drs. Lewin and Rosenthal. (*Glasgow Med. Journ.*, November, 1881, 386. From *Pharm. Journ.*) The author's experiments were made with the object of determining whether chrysarobin undergoes oxidation into chrysophanic acid within the system. It was found that when chrysarobin was administered to a rabbit in the form of a pill made up with bread crumbs, it underwent partial oxidation, a part passing unchanged into the urine, where its presence was indicated by the violet colour produced upon treating a benzol extract of the urine with caustic soda. When the chrysarobin was applied externally as an ointment, it was found that it was absorbed through the skin and partly converted into chrysophanic acid, whilst the part not oxidized excited nephritis during its elimination by the kidneys.

Estimation of the Amylolytic and Proteolytic Activity of Pancreatic Extracts. W. Roberts. (*Journ. Chem. Soc.*, 1881, 1051.) The term *ferment* has hitherto been applied to two groups of agents,

which, although nearly allied in origin and mode of action, nevertheless belong to essentially different categories. The *organized* or *formed ferments*, of which yeast is the type, are independent organisms with powers of growth and reproduction, and the transformations which constitute their special characteristics as ferments are inseparably associated with the nutritive operations of these organisms. The ferment power cannot be separated from the ferment organism by any method of filtration or by any solvent. The *soluble ferments*, on the other hand, pass freely into solution in water; their action is disassociated from the life of the gland-cells which produced them, and they are wholly devoid of the power of growth and reproduction. The author, following Kühne, designates these soluble ferments as "enzymes," and further proposes to designate their action as *enzymosis*, and it nature as *enzymic*.

The pancreas is the source of two ferments or enzymes of capital importance in the digestion of food; viz., an amylolactive enzyme, called *pancreatic diastase*, and a proteolytic enzyme, called trypsin. The pancreas also takes an important share in the digestion of fats; but whether this power is due to an enzyme or to an agent of different character is a question not yet determined. The present paper concerns itself solely with the amylolytic and proteolytic functions of the pancreas.

Estimation of the Amylolytic Activity of Pancreas Extracts: Diastasimetry.—The method adopted by the author for this purpose consists in ascertaining the quantity of starch-mucilage of known strength which can be transformed by a unit-measure of a diastasic solution to the point at which it ceases to give a colour-reaction with iodine, in a unit of time and at a fixed temperature. The vanishing point of the colour-reaction is called the *achromic point*.

The amount of amylolytic work which can be done, or, in other words, the amount of standard starch-mucilage which can be brought to the achromic point in a given time by a given sample of pancreatic extract, is exactly proportional to the quantity of the extract employed, provided the products of the enzymosis do not accumulate in the solution to such a degree as to interfere with the action, which will not be the case if the starch-mucilage used is sufficiently dilute. The mucilage used in the author's experiments was of the strength of 1 per cent. This law of proportionality may perhaps be regarded as applicable to the action of all enzymes, which indeed, having no power of growth or multiplication, conform in this respect to the law which governs the action of ordinary chemical agents.

The fundamental rule governing the relations of quantity and time in the action of an enzyme is that of *inverse proportion;* that is to say, a double quantity of an enzyme will do a given amount of work in half the time, etc. This rule, however, is apparently modified by another; namely, that an *enzyme liberates its energy at a progressively retarded rate.* In regard to the action of pancreatic extract upon starch-mucilage, the rule of inverse proportion between quantity and time was found to hold good within considerable limits, as shown by the following table, giving the results of experiments in which 10 c.c. standard starch-mucilage of the strength of 1 per cent., diluted with water up to 100 c.c., was subjected to the action of pancreatic extract at the temperature of 15°. The "calculated" time in the third column was obtained by taking the middle observation of each set as a standard of comparison:—

Quantity of Pancreatic Extract employed.		Time in which the Achromic Point was reached: Found.	Calculated.
I.	0·02 c.c.	34 minutes.	36 minutes.
	0·04 ,,	18 ,,	18 ,,
	0·08 ,,	9 ,,	9 ,,
	0·10 ,,	7 ,,	7½ ,,
	0·20 ,,	3 ,,	3½ ,,
II.	0·4 ,,	4¾ ,,	5 ,,
	0·2 ,,	10 ,,	10 ,,
	0·05 ,,	40 ,,	40 ,,

In both these sets of observations the inverse time-rate comes out with a very near approach to exactness. When, however, only a relatively small quantity of pancreatic extract was employed, the attainment of the achromic point was postponed beyond the term indicated by the rule. Thus, when 0·004 c.c. of the extract was employed, the achromic point was reached in 125 minutes; consequently, with 0·0005 c.c. extract, the time should, according to the rule, have been 1000 minutes, but it was actually 1,380.

Influence of Temperature.—The action was found to increase in energy (or speed) from 0° to 30°; thence to 45° it continued steady; above 45° it became less and less energetic, and finally ceased between 65° and 70°.

Comparative Diastasic Values of different Pancreatic Extracts.—The diastasic value of an extract is expressed, in the author's system, by the number of cubic centimters of standard mucilage which can be brought to the achromic point by 1 c.c. of the extract to be tested in five minutes at a given temperature. By this mode of

estimating, the author found that the extract obtained from the pancreatic tissue of the pig has at 40° a mean diastasic value of 100, those of the ox and sheep at the same temperature having the values 11 and 10 respectively. Filtered human saliva has a diastasic value of 10 to 17 at 40°, and its energy varies with the temperature, in exactly the same manner as that of pancreatic extract. *Malt diastase* has a diastasic value of 4 to 5 at 40°, increasing to 10 at about 60°, above which it diminishes, but does not cease entirely until the temperature is raised to 80°. Several specimens of human urine showed a diastasic value of 0·03 to 0·13 at 40°.

Proteolytic Activity of Pancreatic Extracts: Trypsimetry.—Milk digested with pancreatic acid acquires the property of curdling when boiled. The onset of this reaction occurs earlier or later according to the activity of the extract and the quantity of it employed; and the time of its advent may be fixed with sufficient accuracy to serve as the basis of a method of measuring the proteolytic activity of pancreatic extracts. The reaction in question depends on the production, as a first step in the digestion, of caseïn, of a modified form of that body—termed by the author metacaseïn—which resembles caseïn in being curdled by acetic acid in the cold, but differs from it in being curdled also by simple boiling. These two reactions together distinguish metacaseïn from all other proteïds. The property of curdling when boiled, which may be called the *metacaseïn reaction*, continues observable in milk undergoing tryptic digestion until near the end of the process; it then disappears somewhat abruptly, the milk remaining fluid when boiled. We may therefore speak of the *onset-point* and the *vanishing-point* of the metacaseïn reaction, these two points marking respectively the initial and terminal limits of the principal phases in the digestion of milk by pancreatic extract. Before, however, the onset-point of the reaction—*i.e.*, distinct curdling—is attained, its approach is indicated by an appearance of soiling of the sides of the test-tube in which the milk has been boiled. This appearance is due to incipient coagulation, which presently develops into pronounced curdling.

When milk is diluted with water, the occurrence of the metacaseïn reaction is postponed, the time of postponement varying with the degree of dilution.

The method of trypsimetry adopted by the author consists in ascertaining how many cubic centimeters of milk can be brought to the onset of the metacaseïn reaction in five minutes by 1c.c. of the extract to be tested at a given temperature, attention being paid, as

in the case of diastase, to the relations of tryptic action to quantity, time, and temperature.

The rule of inverse relation between quantity and time, which was found to be valid within a wide range in the case of diastase and starch, holds good in the case of trypsin and milk within narrow limits only. When the time of action exceeds eight or ten minutes the advent of the metacaseïn reaction is postponed beyond the term indicated by the rule of inverse proportion, and this postponement increases as the time of action is lengthened. When the vanishing-point of the metacaseïn reaction is taken as the point of comparison, the results approximate more nearly to the rule of inverse proportion, especially at low temperatures; nevertheless the evidence points in the same direction, indicating that trypsin, like diastase, exhausts itself in action at a progressively retarded rate. When the onset-point of the reaction falls between three and six minutes, the inverse time-rate gives a trustworthy basis of calculation, but not beyond these limits.

Tryptic enzymosis is exceedingly sensitive to temperature. The action of trypsin on milk increases in energy from 0° to 60°, but above this point there is a rapid fall, the action being finally arrested between 75° and 80° There is not, as with diastase, any range or platform of indifferent temperature.

The following table shows the enzymic values of twelve samples of pancreatic extract prepared with single glands from four pigs, four oxen, and four sheep, killed for the market. All the observations were made at 40°. D stands for diastasic, T for tryptic value:—

Pig.			Ox.			Sheep.		
No. 1.	D = 166	T = 64	No. 5.	D = 8	T = 64	No. 9.	D = 5	T = 125
No. 2.	D = 100	T = 83	No. 6.	D = 10	T = 50	No. 10.	D = 12	T = 83
No. 3.	D = 100	T = 72	No. 7.	D = 9	T = 42	No. 11.	D = 14	T = 64
No. 4.	D = 100	T = 64	No. 8.	D = 13	T = 83	No. 12.	D = 4	T = 28

The oscillations in the two enzymic values do not exhibit any regular relation to each other.

The most appropriate standard of temperature for the valuation of tryptic activity is 40°, as it corresponds very nearly with the temperature at which trypsin operates in the normal digestion of warm-blooded animals; but it is more convenient to perform the testing at or near the ordinary temperature of the room, say at 20°, and the author has ascertained that the values of T obtained at this temperature may be converted with sufficient accuracy into the corresponding values at 40° by multiplying them by 3·5.

Powdered Extracts. C. S. Hallberg. (*Chem. and Drugg.*, 1881, 495.) Ordinary powdered extracts absorb enough moisture during very short exposures to render them a hard mass. The writer finds that this is due to the small percentage of admixture used. Samples of various extract powder, with the addition of 10 and 20 per cent. of milk sugar or dextrine, solidified in securely-corked bottles within a year, although the bottles had not been opened. The German Pharmacopœia orders the powdered extract to be mixed with an equal weight of a neutral powder. This is the smallest practicable addition. But the variation in the yield of extract is so great, even with the same lot of drugs, that it is wiser to make the crude drug the standard, and dilute the extract to half or some proportion of it. Nux vomica, exhausted with 95 per cent. alcohol, yielded 10 per cent. of extract; with 85 per cent. alcohol, 12 per cent. of extract; 75 per cent. alcohol, 14 per cent. extract; 70 per cent. alcohol, 16 per cent. extract. A satisfactory preparation of this troublesome extract was obtained by exhausting with benzine, which removed 5 per cent. of a fixed oil, but no alkaloids; and subsequent exhaustion with 85 per cent. alcohol. Four per cent. extract was obtained, which was mixed with 6 per cent. of milk sugar, and powdered. No satisfactory vessel has been proposed for drying and powdering extracts. Glass plates should be avoided, as well as thin porcelain dishes, if they are considered valuable. A large shallow enamelled iron evaporating dish is the best. The extract should be thinly spread, and dried in a steam closet. When the extract becomes brittle at ordinary temperature, it should be scraped off (care being taken to protect it as much as possible from the air), and immediately powdered with at least one-fourth the amount of the diluent. It should be quickly triturated with the remainder of the diluent and transferred to the wide-mouthed corked bottle.

Emulsions. C. L. Diehl. (*Amer. Journ. of Pharm.*, 1882, 181.) The successful formation of emulsions, whether of fixed or volatile oils, is dependent upon certain rules, well understood by accomplished pharmacists, which when deviated from will invariably embarrass the operator, either by retarding or completely preventing perfect emulsification. These rules are :—

1. That the water and gum arabic shall be in definite and absolute proportion to each other. This proportion is 3 parts of water to 2 parts of gum, both by weight.

2. That the relation of oil to gum (and water) shall be definite within certain limits; that is to say, the mucilage formed in the

above proportions is capable of perfectly emulsifying a minimum and a maximum proportion of oil. The minimum proportion is 2 parts of oil to 1 of gum; the maximum proportion is 4 parts of oil to 1 part of gum.

3. That the trituration of the oil, gum, and water be continued till a perfectly homogeneous milky-white, thick, creamy mixture is formed—*i.e.*, until perfect emulsification takes place—before the addition of a further quantity of water or other liquid.

The thick creamy emulsion obtained, if the above conditions are fulfilled, must be the basis of all perfect emulsions. It will bear dilution to any extent with water, forming mixtures varying, according to the proportion added, from the appearance and consistence of cream to that of very thin milk. Obviously the water may be substituted by solutions of saline compounds, syrups, etc., and this enables the production of the various combinations of cod-liver oil in current use from the above thick creamy emulsion, which for distinction the author designates as:—

1. *Concentrated Emulsion of Cod-liver Oil.*—Take of fresh Norwegian cod-liver oil 8 troy ounces; powdered gum arabic, 2 troy ounces; distilled water, 3 troy ounces. First weigh the gum into a wedgewood or porcelain mortar, then the oil, and triturate till the gum is well mixed with the oil; then weigh into the mixture the distilled water, and triturate the whole briskly until the mixture thickens and acquires a pasty consistence and milky whiteness. Now scrape down the portions adhering to the sides of the mortar and to the pestle, and continue the trituration for a short time; after which add such other ingredients as may be desirable, or transfer the concentrated emulsion to a wide-mouthed bottle for future use.

This concentrated emulsion will keep for a reasonable time in cold weather, and, if placed in the ice chest, also during warm weather. It may therefore be kept in stock if the demand for emulsions is brisk enough to justify it; but inasmuch as its preparation does not consume more than five or ten minutes, it is advised to always prepare it fresh, or at all events, never to prepare more than a week's supply, particularly in summer. Its consistence is such that it is poured out of the containing vessel with difficulty; hence the necessity of using one with a wide mouth, which should be as securely stoppered as possible, and should be cleaned very carefully each time it is refilled. All this takes time and involves trouble, which is prevented by preparing the concentrated emulsion only as required.

2. *Simple Emulsion of Cod-liver Oil.*—Take of concentrated emulsion of cod-liver oil 13 troy ounces; oil of wintergreen, 24 drops; syrup, 1 fluid ounce; water, 3 fluid ounces. Weigh the concentrated emulsion into a mortar, add the oil of wintergreen, and triturate thoroughly; then gradually add first the water and then the syrup.

The manipulation for this emulsion is typical for all the other cod-liver oil emulsions given below. It has the consistence of very thick cream, but is readily poured out of narrow-mouthed bottles, is milky white, and mixes readily with water or other liquids that may be administered with it. It contains exactly fifty per cent. (by volume) of oil, the quantity that manufactured emulsions are stated to contain, but do not always contain that proportion. The oil of wintergreen disguises the odour of the cod-liver very admirably, and has the further advantage that it acts as a preservative.

3. *Emulsion of Cod-liver Oil with Hypophosphite of Lime.*—This differs from the simple emulsion in that 128 grains of hypophosphite of calcium are dissolved in the water, each tablespoonful of the finished emulsion containing 4 grains of that salt.

4. *Emulsion of Cod-liver Oil with Hypophosphite of Lime and Soda.*—This differs from the simple emulsion in that 128 grains of hypophosphite of calcium and 96 grains of hypophosphite of sodium are dissolved in the water, each tablespoonful of the finished emulsion containing 4 grains of the calcium and 3 grains of the sodium salt.

5. *Emulsion of Cod-liver Oil with Hypophosphites.*—This differs from the simple emulsion in that 128 grains of hypophosphite of calcium, 96 grains of hypophosphite of sodium, and 64 grains of hypophosphite of potassium are dissolved in the water; each tablespoonful containing 4 grains of the calcium, 3 grains of the sodium, and 2 grains of the potassium salt, and corresponding to a teaspoonful of Churchill's syrup of the hypophosphites.

6. *Emulsion of Cod-liver Oil with Phosphate of Lime.*—This differs from the simple emulsion in that 256 grains of phosphate of calcium are dissolved in the water by the aid of 128 grains of hydrochloric acid; each tablespoonful containing 8 grains of the phosphate held in pleasantly-acid solution.

7. *Emulsion of Cod-liver Oil with Phosphate of Lime and Soda.*—This differs from the simple emulsion in that 256 grains of phosphate of calcium and 64 grains of phosphate of sodium are dissolved in the water acidulated with 128 grains of hydrochloric acid; each tablespoonful containing 8 grains of the calcium and 2 grains of the sodium salt.

8. *Emulsion of Cod-liver Oil with Lactophosphate of Lime.*—This differs from the simple emulsion in that 256 grains of lactate of calcium dissolved in 2 fluid ounces of diluted phosphoric acid are substituted for 2 fluid ounces of the water, each tablespoonful containing 8 grains of lactate of lime, or about 10 grains of lactophosphate.

9. *Emulsion of Cod-liver Oil with Wild-cherry Bark.*—This differs from the simple emulsion in that oil of wintergreen is replaced by 8 drops of bitter almonds, and in that 1 fluid ounce of the fluid extract of wild-cherry bark is substituted for 1 fluid ounce of the water; each tablespoonful containing 15 minims of the fluid extract and one-fourth of a drop of oil of bitter almonds.

Other combinations of cod-liver oil with different medicinal agents may be effected in the same way as pointed out above, or the proportions of salts may be varied to suit particular cases. The process for the concentrated emulsion also may be applied to the emulsification of other oils, as, for instance, in the following:—

10. *Emulsion of Castor Oil.*—Take of castor oil 4 troy ounces; powdered gum arabic, 1 troy ounce; syrup, cinnamon water, of each 3 fluid ounces; spirit of cinnamon, 12 minims. Emulsify the oil with the gum and distilled water, as directed under No. 1, then add the other ingredients successively with constant trituration. This emulsion contains thirty-three per cent. of castor oil, and is consequently more limpid than the fifty per cent. cod-liver oil emulsions above described, and is in every respect an elegant preparation.

Glucose as an Excipient for Pill Masses. P. W. Lascheid. (*Amer. Journ. of Pharm.*, July, 1881.) A series of experiments was made with a view of determining the comparative value of some of the most prominent excipients recommended. The excipients used were: (1) glycerite of starch; (2) glycerite of tragacanth, made with 1 part of gum to 8 parts of glycerine; and (3) glucose.

Vegetable powders are not unfrequently prescribed in conjunction with an extract, serving as an excipient, and if the mass be too hard or too soft, water or a dry substance is added for obtaining the proper consistency. When no excipient is ordered, the use of glucose will give entire satisfaction, requiring less time and less labour than the other excipients, and adding but little to the bulk of the pill as compared with the other excipients.

To make a pill-mass of powdered *rhubarb* 18 parts, and glucose 10 parts, or glycerite of tragacanth 9 parts, required about the same time and labour; but with glycerite of starch 10 parts, more labour

was necessary. On testing the pills with water, those made with glucose were completely disintegrated before any visible effect was shown upon those made with other excipients.

Pilula aloes are sometimes prescribed to be made without soap. Glucose forms with aloes an excellent pill mass, yet it cannot be recommended for the purpose, as the pills are less readily soluble, requiring five times the length of time for solution. For 12 grains of aloes, 4 grains of glucose and 2 drops of water were used.

Vegetable powders and salts are, with more or less difficulty, made into suitable pill masses. When the salts are in excess, Hager recommends the use of bread, which, however, greatly increase the size of the pills. Ferri sulphas and pulv. glycyrrhizæ, āā gr. x., were made with glucose, gr. ix., glycerite of tragacanth, gr. vi., and with glycerite of starch, gr. viii.; the last-mentioned excipient is the least desirable, since the mass suddenly softens. In this case glucose is to be preferred as a useful excipient; the pills made with it were completely disintegrated three minutes before the water had any effect upon those made with the other excipients.

Pill masses consisting of ferri sulphas, potassi carbonas, and pulv. aloes socotr., āā gr. x. were made, using 6 grains of glucose and 5 grains of the glycerites respectively. The latter became quite hard in a short time. Immersed in water, those made with glucose and glycerite of starch were disintegrated in about the same length of time; while one hour and a half additional time was required for those containing tragacanth.

Resins and Gum Resins.—The trituration of these substances with alcohol, as recommended by Hager and others, does not give the best results, too much time and patience being required for obtaining the proper consistency. In most cases the mass is readily formed with glucose, which seems to have the effect of softening the substance. Guaiacum resin, however, is an exception, since too much time is necessary for forming a pill mass with glucose; but the addition of a minute quantity of tragacanth aided the operation in a marked degree. For resina guaiaci, gr. xxiv., 16 grains of glucose and 15 grains glycerite of starch were used, the latter requiring the addition of a little powdered liquorice root. Both kinds of pills, after remaining in water for twelve hours, had separated into particles floating in the water.

Mastiche, gr. xxiv., yields, with 16 grains of glucose, a very satisfactory result, the pills being of a clear, pale yellow colour when finished. When glycerite of starch was used, a little tragacanth did not give a satisfactory result (also not with resin of guaiacum).

The mastic pills with glucose were completely disintegrated in five minutes, those with glycerite of starch in fifteen minutes.

In pilulæ aloes et asafœtidæ, U. S. P., the soap can be advantageously replaced by glucose (24 grains) when rapid solubility is a point of consideration, the latter dissolving in one-half the time necessary for those made with soap.

Glucose may also with advantage be substituted for the syrup in the formula for pil. galbani comp., U. S. P.

Cinchona Alkaloids.—Of the numerous excipients heretofore recommended, glycerin is probably the best for the production of an elegant *white* quinine or cinchonidine pill; but a comparative trial will prove, both as regards manipulation and appearance, that glucose is superior. For quiniæ sulphas, gr. vi., 3 grains of glucose, and for cinchonidiæ sulphas, gr. xii., 5 grains of glucose were used. The pills are made readily in less time, and are of smaller size than when made with most other excipients.

Quiniæ sulphate and exsiccated ferrous sulphate, of each 6 parts, were made into pills, using in one case 5 parts of glucose, and in the other 4 parts of a mixture of glucose and glycerin. The former pills were completely disintegrated in less time than those made with the mixture.

The author had formerly regarded glycerite of tragacanth as the most useful excipient, but his experiments convinced him of the superiority of glucose in most cases, which also served the purpose admirably with a number of substances that had previously occasioned more or less difficulty, particularly mixtures of aloes and exsiccated ferrous sulphate, quinine sulphate and sodium salicylate, calomel and prepared chalk, tannin and opium, lead acetate and opium, and others. In all these cases the pills made with glucose were readily dissolved or completely disintegrated.

Note on Confection of Sulphur. P. Boa. (From a paper read before the North British Branch of the Pharmaceutical Society, Feb. 8, 1882, and published in the *Pharm. Journ.*, 3rd series, xii., 682.) With the object of preventing the deposition of sulphur in this confection, and to obtain a more homogeneous preparation than that of the B. P., the author suggests the introduction of a suitable proportion of tragacanth. With this addition the formula for the confection would be as follows:—

Sublimed Sulphur	4 ounces.
Acid Tartrate of Potash, in powder . .	1 ounce.
Tragacanth, in powder	18 grains.
Syrup of Orange Peel	4 ounces.

Rub the powders together, and mix thoroughly with the syrup.

Preservation of Ergot. E. Perret. (*Bull. géner. de Thérap.*, 1882, 202.) The author directs the ergot to be bruised and dried at 40° C., then powdered and again dried at 80° C. It is then exhausted in a percolator with strong ether, and the exhausted powder dried at 35° C. for several hours, after the expiration of which the heat is gradually and very slowly raised to 100° C., but not maintained at the last-named temperature for more than a few seconds. The resulting dry powder is kept in small vials.

The Preparation of Tincture of Rhubarb. (*Chem. and Drugg.*, 1881, 358.) Clarke states that the marc of tinctura rhei contains a large proportion of chrysophanic acid. At the first glance this seems to indicate that the menstruum used for the extraction of the drug is not strong enough in alcohol. The fact that the fluid extract made with more alcohol does not precipitate confirms the idea. An increased alcoholic strength would prevent the precipitate, but it would interfere with the therapeutic action of the tincture. The origin of the deposit is not the alcoholic weakness of the menstruum, but the presence of a substance or substances in the tincture which cause a precipitate; for a tincture made with strong alcohol, and then diluted, remains unchanged.

The presence of starch and pectic acid in the rhubarb cause and suggest a means of preventing the precipitate. Both are unstable and apt to originate chemical change, and both are sure to be present, to a greater or less extent, in a tincture prepared with diluted alcohol. In one made with strong alcohol they are absent. This, then, is the remedy. Prepare the tincture with 92 per cent. alcohol, and afterwards dilute it to the required strength. The resins precipitated by the addition of water do not affect the medicinal effect of the tincture, and can easily be removed by filtration.

Preservation of Fowler's Solution. E. Dannenberg. (*Pharmaceut. Zeitung*, 1881, 665.) In order to avoid the growth of algæ and the conversion of arsenious into arsenic acid by oxidation, the author suggests that a small quantity only of this solution should be prepared at a time, and that this should be preserved in small bottles filled up to the stopper and kept in a horizontal position.

Solution of Morphia for Hypodermic Use. Prof. Hamberg. (*Pharmaceut. Zeitung*, 1881, No. 49.) The author finds morphine sulphate to be less prone to decomposition and to the formation of mycelia than the hydrochlorate and other salts, and therefore considers the sulphate best adapted for medicinal morphine solution. It should be dissolved in pure boiling distilled water; the

solution should be filtered through paper not previously moistened, and is best preserved in glass bottles, well filled.

Table of Solubilities. W. P. Morrison. (*Proc. Cal. Pharm, Soc.*) The following table gives the number of cubic centimetres of diluted alcohol of 0·941 sp. gr. required to dissolve 1 gram of the salts named at a temperature of 60° F.:—

Acidum benzoicum	20·00
,, citricum	1·00
,, oxalicum	8·00
,, salicylicum	42·00
,, tartaricum	1·25
Aluminii et ammonii sulph.	760·00
Ammonii bromidum	3·00
,, carbonas	10·00
,, chloridum	6·00
Antimonii et potassii tartras.	490·00
Argenti nitras	2·50
Cinchoniæ sulphas	20·00
Codeine	4·40
Cupri sulphas	518·00
Ferri sulphas	236·00
Hydrargyri chloridum corros.	20·00
Lithii carbonas	1790·00
,, citras	25·00
Magnesii sulphas	47·33
Morphiæ acetas	50·00
,, murias	26·00
,, sulphas	40·00
Plumbi acetas	8·00
Potassii acetas	·50
,, bicarbonas	22·00
,, bromidum	4·50
,, carbonas	1·00
,, chloras	88·60
,, citras	1·00
,, ferrocyanidum	570·00
,, iodidum	1·60
,, nitras	24·00
,, et sodii tartras	29·00
,, sulphas	700·00
,, sulphis	460·00
Quiniæ sulphas	150·00
Quinidæ sulphas	28·00
Saccharum lactis	58·00
Sodii acetas	3·00
,, bicarbonas	83·33
,, boras	402·00
,, bromidum	2·50

Sodii hypophosphis	5·80
,, hyposulphis	3·00
,, phosphas	298·00
,, salicylas	19·60
,, sulphas	81·20
,, sulphocarbolas	18·00
Strychniæ sulphas	60·00
Zinci sulphas	48·00

The Solubility of Essential Oils in Alcohol as a Test of their Purity. Dr. H. Hager. (*Pharmaceut. Centralhalle*, Jan. 12, 1882; *New Remedies*, 1882, 168.) The behaviour of essential oils towards alcohol of certain strengths has been made the bases of several methods of testing their purity (*Year-Book of Pharmacy*, 1874, 287, and 1876, 289). The author describes his own process as follows:—

Mix 1 volume of essential oil at 16–18° C. (about 60–60·5° F.) with 2 volumes of absolute alcohol (sp. gr. 0·799). When the mixture has become clear, add diluted alcohol of sp. gr. 0·889, containing 70·9 per cent. by volume of absolute alcohol, in small portions or in drops, until the mixture has become, after one minute, so far turbid that it only appears opalescent when agitated, without being milky. In many cases, the further addition of a drop of diluted alcohol is sufficient to render the opalescent mixture milky-white. If the opalescence, at the above-named temperature, is accompanied by flocculent particles, in the case of oil of anise, rose, and similar oils, the adulterant may be spermaceti, paraffin, or other such bodies.

If the mixture is turbid, but still translucent, more of the diluted alcohol is added, until the proper point is reached. It should be barely translucent.

This alcohol test permits the recognition of adulteration in most cases, though not always the precise adulterant. The latter must be sought for by other means.

In general, it may be stated that most of the terpenes and oil of copaiva, after being mixed with two volumes of absolute alcohol, bears only a very small addition of the diluted alcohol until they become cloudy. Oil of turpentine, and of coniferæ generally, oil of juniper and of eucalyptus, become turbid or milky-white already when mixed with one or two volumes of absolute alcohol. Since all these oils are used as adulterants, their presence interferes with the solubility of the ethereal oils in the absolute alcohol. Fatty oils, except castor oil, are likewise indicated by the test.

Benzol, alcohol, and chloroform increase the solubility of oils in the diluted alcohol; terpenes, carbon bisulphide, and oil of copaiva decrease it. For instance, if oil of bergamot, after being mixed with two volumes of absolute alcohol, bears the addition of five volumes of the diluted alcohol without becoming turbid, it is probably adulterated with benzol or alcohol. If oil of mustard bears five to six volumes of the diluted alcohol, it probably contains carbon bisulphide. If oil of savin yields a somewhat turbid mixture with two volumes of absolute alcohol, oil of turpentine may be present; and if the mixture is clear and requires two to three volumes of the diluted alcohol to render it turbid, it is adulterated, probably with benzol or alcohol, etc.

The following list is given by the author, with the statement that the results are based upon tests made with two or three kinds of each oil. He adds that possibly a few of the figures require further confirmation or correction.

Where *x* is quoted, the oil is completely soluble in the diluted alcohol. If the mixture of the oil with two volumes of absolute alcohol is turbid or milky, this is specially stated.

The figures in brackets denote the sp. gr. of the oils which were examined.

A mixture of one volume of essential oil and two volumes of absolute alcohol (0·799)	requires, to be rendered opalescent, vol. of dil. alcohol, sp. gr. 0·889.
Benzol (sol. in 9 vols. of the dil. alcohol).	
Carbon disulphide (1·272) . . .	0·8 to 0·9
Chloroform (1·495)	10 ,, *x*
Nitrobenzol (oil of mirbane, 1·185)	10 ,, *x*
Oil of almonds, bitter (0·960) .	10 ,, *x*
,, amber, rect. (0·858) . . .	0·3 ,, 0·5
,, angelica root (0·898) . . .	0·5 ,, 0·7
,, ,, seed (*milky-white*).	
,, anise, Russian (0·981) . . .	1·3 ,, 1·5
,, ,, very old (0·990) . . .	10 ,, *x*
,, ,, star, fresh (0·976) . .	0·8 ,, 1·0
,, ,, ,, (0·979) . . .	1·2 ,, 1·4
,, bergamot (0·875) . . .	1·0 ,, 1·3
,, cade (1·005).	0·05 ,, 0·15
,, cajuput (0·920)	3·0 ,, 4·0
,, ,, green (0·904) . . .	8·0 ,, 10·0
,, ,, old	5·0 ,, 8·0
,, calamus (0·920; 0·940) . .	0·9 ,, 1·1
,, cardamom (0·980) . . .	1·5 ,, 2·0
,, caraway (0·945)	3·0 ,, 5·0
,, ,, old (0·955) . . .	8·0 ,, 10·0

A mixture of one volume of essential oil and two volumes of absolute alcohol (0·799)	requires, to be rendered opalescent, vol. of dil. alcohol, sp. gr. 0·889.
Oil of caraway rectif. (0·903)	1·8 to 2·0
,, cinnamon cassia (1·030)	2·0 ,, 2·5
,, ,, Ceylon	15·0 ,, *x*
,, cloves (1·060)	10·0 ,, *x*
(*Sol. in* 2 *vols. dil. alcohol.*)	
,, copaiva (0·920)	0·3 ,, 0·35
,, coriander (0·880)	5·0 ,, 10·0
,, cubeb (0·945) *turbid mixture.*	
,, ,, (0·920)	0·05 ,, 0·1
,, curled mint (mentha crispa) (0·940)	0·8 ,, 1·1
,, dill (0·880)	3·5 ,, 5·0
,, eucalyptus (0·900) *milky-turbid.*	
,, fennel (0·990)	0·8 ,, 1·1
,, ,, very old	1·3 ,, 1·5
,, juniper berries (0·850) *milky-turbid.*	
,, juniper wood (0·860)	0·5 ,, 0·75
,, lavender (0·890)	2·0 ,, 2·5
,, ,, old (0·888)	10·0 ,, *x*
,, lemon (0·870)	0·2 ,, 0·4
,, ,, (quintessential)	4·0 ,, 4·2
,, limetta (0·900)	0·15 ,, 0·3
,, lemongrass (0·888)	6·0 ,, 10·0
,, mace (0·895)	0·6 ,, 0·9
,, marjoram (0·901)	1·5 ,, 2·5
,, melissa (0·878)	3·0 ,, 3·3
,, mustard, ethereal	10·0 ,, *x*
,, neroli (0·870)	2·5 ,, 3·3
,, orange, sweet (0·850)	0·3 ,, 0·5
,, ,, bitter (0·876)	0·35 ,, 0·5
,, palmarosa	1·2 ,, 1·5
,, parsley (0·950)	1·0 ,, 1·3
,, patchouli (0·980)	0·4 ,, 0·5
,, peppermint (0·915)	1·2 ,, 1·9
,, ,, very old (0·925)	5·0 ,, 6·5
,, rose (0·860)	0·4 ,, 1·2
,, rosemary, French (0·894)	2·5 ,, 2·8
,, ,, Ital. (0·904)	4·0 ,, 5·0
,, rue (0·890)	4·0 ,, 5·0
,, savin (0·898)	0·5 ,, 0·7
,, sage (0·920)	1·5 ,, 1·8
,, santal (0·980)	4·0 ,, 5·0
,, sassafras (1·060)	1·7 ,, 1·8
,, ,, very old (1·080)	3·5 ,, 4·0
,, tansy (0·920)	2·0 ,, 2·5
,, thyme (0·895)	1·0 ,, 1·4
,, turpentine (0·890) *milky-turbid.*	

A mixture of one volume of essential oil and two volumes of absolute alcohol (0·799).	requires, to be rendered, opalescent vol. of dil. alcohol, sp. gr. 0·889.
Oil of valerian (0·970)	3·5 to 4·5
,, verbena (0·895; 9·863) *milky-turbid.*	
,, vetiver (0·923)	0·9 ,, 1·1
,, wintergreen (1·158) . . .	7·0 ,, 10·0
,, wormseed, levant (0·920) .	10·0 ,, *x*
,, wormwood (absinth.; 0·965)	3·5 ,, 5·0
,, ,, (chenopod; 0·960)	8·0 ,, 10·0
,, ylang-ylang (1·009) . . .	0·7 ,, 0·9

Note on a Fat recently much offered as an Adulterant of Lard. Dr. J. Muter. (*Analyst*, 1882, 93.) The fat reported upon by the author possesses the following properties: (1) It has an actual density at 100° F. of ·9115 to ·912. (2) It yields on saponification 95·5 per cent. of fatty acids, all insoluble. (3) It is completely soluble in ether and in hot absolute alcohol. (4) When melted and treated by the author's modification of Chateau's course, it gives reactions for cotton oil. It is, therefore, evidently the "stearine" separated out during the rectification of that oil. A most striking fact is, that although nicely made to almost the exact consistence of lard at ordinary temperature, and not becoming perfectly fluid under 90° F., yet after melting it does not again solidify, but remains a yellow oil, having the distant odour of fine cotton salad oil, until it has been kept at 40° F. for some time, when it again resumes its original appearance. Its detection in lard is happily rendered simple by its high density and by the article not setting so solid as it was at first, after having been kept melted for the purpose of taking gravity.

Antiseptics. R. Koch. (*Monit. Scient.*, May, 1882.) The author has endeavoured to ascertain what agents are able to destroy the spores of bacilli, how they behave towards the microphytes most easily destroyed, such as the moulds, ferments, and micrococci, and if they suffice at least to arrest the development of these organisms in liquids favourable to their multiplication. His results with phenol, thymol, and salicylic acid have been unfavourable. Sulphurous acid and zinc chloride also failed to destroy all the germs of infection. Chlorine, bromine, and mercuric chloride gave the best results; solutions of mercuric chloride, nitrate or sulphate, diluted to 1 part in 1000, destroy spores in ten minutes.

The Antiseptic Properties of Cinnamic Acid. G. B. Barnes. (A paper read before the Pharmaceutical Society, December 7, 1881, and printed in the *Pharm. Journ.*, 3rd series, xii, 477.)

The following *résumé* of the author's results exhibits the solubility and the effects of cinnamic acid on the animal and vegetable substances experimented upon :—

Soluble in	Lard	3·0	per cent.
,,	Cocoa Butter	0·5	,,
,,	Oil of Sweet Almonds	1·0	,,
,,	Cod-liver Oil	2·0	,,
,,	White Wax	3·0	,,
,,	Paraffin	0·5	,,
,,	Oleic Acid	5·0	,,
,,	Benzol	1·0	,,
,,	Ether	20·0	,,
,,	Chloroform	8·0	,,
,,	Glycerin of Borax	1·5	,,
,,	Water	$\frac{1}{10}$	,,
,,	Olive Oil	1 in 66	parts.
,,	Vaseline	1 in 40	,,
,,	Spermaceti	1 in 66	,,
,,	2 p. c. aqueous solution of phosphate of soda	1 in 50	,,
,,	2 p. c. solution of borax	1 in 25	,,
,,	Glycerin	1 in 400	,,

4 fluid ounces of albumen solution, with 2 grains cinnamic acid, at 60° F., became putrid on the eighteenth day.

With 4 grains cinnamic acid it still remains bright and free from putridity, although eighteen days have elapsed.

4 fluid ounces of gelatine and water, with 2 grains cinnamic acid at 60° F., became putrid on the fifteenth day.

With 4 grains it still remains bright and firm, although seventeen days have elapsed.

4 fluid ounces of wine, with 2 grains cinnamic acid, at 60° F, became cloudy on the twenty-ninth day, and on thirty-first putrid.

4 fluid ounces of decoction of malt and yeast, with 2 grains of cinnamic acid at 60° F., retarded fermentation most distinctly.

4 fluid ounces of infusion of malt made with cold water, with 2 grains of cinnamic acid, at 60° F., broke down on the thirty-sixth day.

With 4 grains it has remained unchanged fifty-one days.

4 fluid ounces of acid infusion of roses, with 2 grains cinnamic acid, at 60° F., has remained unchanged sixty days.

4 fluid ounces of infusion of hay, with 4 grains cinnamic acid, at 60° F., has remained bright and retained its pleasant odour, although seventeen days have elapsed.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Poisonous Action of Resorcin. Dr. Murrell. (*Med. Times and Gazette*, 1881, 486.) The author publishes a case of poisoning from the administration of 2 drachms of resorcin in the treatment of asthma. The resorcin is stated to have been prepared by the action of sulphuric acid on benzene vapour, and not to have contained more than 2 to 3 per cent. of impurity. He mentions that he has given as much as 40 grains every four hours without producing unpleasant symptoms. The antidotes that have been suggested by Dr. Andeer, are albuminate of iron and red wine; and by the author, hypodermic injection of atropine. Olive oil, emetics, and subsequently brandy and inhalation of nitrite of amyl, were the remedies used in this case.

Application of Peroxide of Hydrogen for Medicinal Purposes. Dr. P. Ebell. (*Chem. News*, Feb. 17, 1882.) The peroxide of hydrogen has not hitherto played a conspicuous part in therapeutics. The reason for that may be, that formerly pure and durable solutions were not to be had at a reasonable figure. Price, however, is no longer an impediment to its use, and the tendency of the peroxide of hydrogen, as at present obtainable, to decompose can be considerably restricted; possibly peroxide of hydrogen turned into simple water may formerly have led to wrong conclusions. Peroxide of hydrogen, if preserved in the dark, and in a temperature not exceeding 25° C. (77° F.), keeps unaltered for months. For ascertaining its titre of active oxygen, a normal solution of permanganate of potash is requisite; it would be advisable to fix a minimum titre of active oxygen. It is to be supposed that peroxide of hydrogen like chloride, bromide, and permanganate of potash, is poison to the smallest organisms (bacteria); exact comparative experiments with a view to ascertain this are much to be desired, considering the importance of the matter. Experiments with yeast had very favourable results, and proved that the germs of the yeast are entirely killed by peroxide of hydrogen, even when greatly diluted.

As regards the fitness of peroxide of hydrogen for treating wounds caused by syphilitic, scrofulous, and tuberculous ulcers, favourable experience has been gleaned by a physician at Hanover. It is probable that peroxide of hydrogen will do good service in the shape of spray in making operations and ligatures ; this would be important, considering the effect which carbolic acid spray often has on operators and patients.

The great advantages possessed by peroxide of hydrogen, as compared with other media of disinfection are,—

1. Complete absence of smell.

2. Yielding oxygen without leaving any other residuum but pure water.

3. Absence of injurious influence on the organism.

The workmen occupied in making the peroxide of hydrogen get exceedingly delicate hands, and wounds heal visibly under its influence.

There further seems room for employing the peroxide of hydrogen as a means of disinfecting sick chambers and generally for purifying the air. It would be advisable to spread by means of a rafraîchisseur spray of diluted peroxide of hydrogen by way of trial.

Attention must also be drawn to the use of peroxide of hydrogen in dentistry, as has in the first place been done by C. Sauer (*Quarterly Review of Dentistry*, 1879, No. IV.). Sauer made use of the peroxide of hydrogen with success in bleaching discoloured and carious teeth. In cases where the teeth are covered with coloured matter (*Lichen dentalis*, etc) he employs peroxide of hydrogen in conjunction with finely levigated pumice-stone, as a means of cleaning, in place of water. Teeth, the natural channels of which were filled with coloured matter, became somewhat paler after several applications. A suitable liquid for cleaning the teeth and mouth is prepared by mixing 1 part of 3 per cent. peroxide of hydrogen with 10 parts of water. In case of carious teeth the peroxide of hydrogen on wadding was locally used with advantage.

Bleaching of Hair with Peroxide of Hydrogen. Dr. P. Ebell. (*Chem. News*, Feb. 17, 1882.) The hair is digested for twelve hours in a solution of 3 parts carbonate of ammonia in 100 parts of water at a temperature of 30° C., rinsed, then washed with soap, and all the fatty matter removed with the help of a fresh solution of carbonate of ammonia. Benzene can also be recommended. Prepared in this way, it is immersed in a bath of peroxide of hydrogen (a 3 per cent. solution), fully neutralized with liquid ammonia.

It either remains in the bath until sufficiently bleached, or is

dried in a room at ordinary temperature and the immersion repeated.

The baths must only be considered exhausted when some drops of permanganate of potash produce in the liquor a permanent red coloration.

It has not been found feasible to bleach black hair so that it becomes perfectly white, its colour only disappearing so far as to arrive at a light golden fair hue. Even a jet black Chinese tail does not resist.

The bleaching of hair even on living persons does not present any difficulties. After the desired degree of bleaching has been arrived at, an after-treatment by washing with water, followed by a wash with alcohol, takes place; hot liquors, or drying in drying chambers, are excluded.

Bleaching of Ivory and Bone with Peroxide of Hydrogen. Dr. P. Ebell. (*Chem. News*, Feb. 17, 1882.) The bones perfectly freed from fatty matter are immersed—preferably while in a primary state of manufacture—in an almost neutral solution of peroxide of hydrogen, and left in this bath as long as may be requisite. The process of bleaching takes place smoothly and safely; even spots of blood in the pores acquire a perfectly white appearance.

Ivory is treated in exactly the same way as bones; fans, handles of walking sticks, and knife handles, bleached by peroxide of hydrogen are already being used very extensively.

A Process for Decolorizing Carbolic Acid P. Yvon. The author has recommended to the *Société de Pharmacie* an apparently very simple means of freeing carbolic acid from the colouring substance which it frequently contains. It is only necessary to dissolve the carbolic acid in its own weight of glycerin. The resulting solution may be mixed with water in all proportions. If it be allowed to stand at rest, a more or less thick layer collects on the surface, which contained the whole of the colouring matter. It may be separated by decanting or by filtering through cotton.

Deodorization of Alcohol. L. Naudin and J. Schneider. In a communication to the *Chemiker Zeitung*, the authors state that the odour which alcohol owes to the presence of foreign substances may be removed by generating hydrogen in the liquid either by zinc and hydrochloric or sulphuric acid, or by means of sodium amalgam.

Masking the Odour of Iodoform. M. Catillon. (*Gazette Hebdom. de Med. et de Chim.*, Nov., 1881.) The author recommends the introduction of a fragment of Tonquin bean into the bottle in which the iodoform is kept. This addition modifies the odour in such a

manner as to make it resemble that of bitter almonds; and this changed odour remains perceptible for several days after the iodoform has been removed from the bottle.

Local Application of Quinine as a Remedy for Colds and Hay Fever. Dr. N. Falliott. (*New Remedies*, 1882, 133.) In a communication to the *British Medical Journal*, the author states that coryza or nasal catarrh may be cured in a few hours, if taken at the onset, or at most twelve hours afterwards, by the inhalation of a spray of sulphate of quinine. The solution used is made by dissolving four grains of quinine in an ounce of water, with just sufficient dilute sulphuric acid to dissolve it, and scenting with any agreeable perfume. The solution is injected up the nostrils in the form of spray with an ordinary hand-ball spray producer, in such a way that the quinine can be tasted at the back of the mouth. This is done every hour or oftener, according to the urgency of the symptoms. He states that this remedy has been tried with success in hay fever, and that if nasal catarrh is of parasitic origin, as he strongly suspects, the action of quinine is at once apparent. It might be added that, even supposing catarrh to be the result of sudden change of temperature, the action of quinine in contracting the superficial capillaries would be quite as obvious. It is somewhat surprising that this property of quinine does not appear to have been tried for chilblains in the itching state, when the capillary vessels are dilated.

Formula for the Local Treatment of Diphtheria. Dr. A. W. W. Williams. In a communication to the *British Medical Journal*, the author says that he finds the following formula the best local application in diphtheria:—

Tannic Acid	2 drachms.
Spirit of Wine	2 ,,
Water	6 ,,

applied every hour to the diphtheritic membrane until all has peeled off.

Lemon Juice in Diphtheria. Dr. J. R. Page. (From *New York Medical Record.*) The author invites the attention of the profession to the topical use of fresh lemon juice as the most efficient means for the removal of membrane from the throat, tonsils, etc., in diphtheria. It has proved by far the best agent he has yet tried for the purpose. He applies the juice of the lemon, by means of a camel's hair probang to the affected parts every two or three hours, and in eighteen cases in which he has used it, the effect has been all he could wish.

Nitre Tablets for Asthma and Insomnia. Dr. W. Murrell. In a communication to the *British Medical Journal*, the author states that there can be no question as to the value of fuming inhalations in the treatment of asthma. The ordinary nitre paper often fails, because it is not strong enough. For some time past the author has been in the habit of using very thick and strong nitre papers, which may be called "nitre tablets." They contain both chlorate and nitrate of potash. Each consists of six pieces of white blotting paper, about six inches square, and they are made by dipping them into a hot saturated solution of nitre and chlorate of potash. Before the pieces are quite dry, they may be sprinkled with friar's balsam, spirit of camphor, tincture of sumbul, or some aromatic. The nitre-paper so prepared is as thick as cardboard, each piece consisting of six pieces of blotting paper, closely adherent, and covered all over with crystals of saltpetre and chlorate of potash. The doors and windows having been closed, the tablet is placed on a fire-shovel or a piece of metal of some kind, and folded down the middle, so as to make it like a tent or the cover of a book. When lighted at each end it burns very quickly, throwing out a flame over four or five inches long, and giving rise to dense volumes of smoke. The asthmatic patient almost immediately obtains relief, and drops off into a quiet slumber, from which he awakes refreshed. These tablets often succeed when the ordinary nitre papers do no good. They nearly always induce sleep, and have been used with success in cases of insomnia, when most of the remedies have failed. Large pastilles, composed of equal parts of nitre and lycopodium, are also useful in asthma.

Camphorated Chloride of Calcium. C. Pavesi. (*Annali di Chimica*, January, 1882. From *Pharm. Journ.*) With the view of investigating the results obtained from the application of antiseptic substances to the cure of infectious diseases, the author has, at different times, undertaken various researches into the properties of aromatic, antiseptic, and disinfecting substances. His attention was hence attracted in a special way to camphor and chloride of calcium, chloride of calcium being chosen as possessing all the antiseptic properties of chlorine, whilst it is not only not deleterious, but it is of easy application.

The author describes the properties, the mode of preparation, as well as the various applications of a compound which he has obtained by mixing chloride of calcium with camphor, in certain proportions and under particular conditions, and which he considers to possess valuable properties that ought no longer to be neglected, either by physicians or pharmacists.

The compound, which he has called "camphorated chloride of calcium," is easily prepared. The following process will be found the quickest and most economical:—

Chloride of Calcium	50 parts.
Powdered Camphor	5 ,,
Alcohol	25 ,,
Common Water	150 ,,

The camphor is dissolved in the alcohol in a glass flask, and the chloride of calcium and water added to it. The ingredients must be thoroughly mixed, by allowing the mixture to stand for several days, during which time it must be well shaken every now and then. This having been done, the preparation must be filtered through bibulous paper. To the residue remaining in the filter a small quantity of dilute alcohol should be added, so as to dissolve as much as possible out of the mixture.

Thus prepared, camphorated chloride of calcium forms a limpid liquid, the odour of which recalls those of chloride of calcium and camphor. The liquid will not bear dilution with water, which throws down the camphor as a flocculent precipitate.

The solution added to milk coagulates it immediately, the curd formed keeping perfectly sweet for a length of time. It also coagulates both egg and blood albumen, and preserves the coagulum thus formed from decomposition for a lengthened period. Meat immersed in it is also preserved from decomposition. It turns blue litmus paper red, and iodized starch paper blue, as well as paper soaked in tincture of guaiacum; the latter possibly from the development of ozone.

Placed in contact with wounds, it is said to act as an antiseptic, and to seem destined to render important services in this direction also, as a hæmostatic. Cotton wool, tow, compresses, bandages, etc., soaked in it and applied to syphilitic ulcers, open wounds, cancerous sores which have been suppurating for a long time, are immediately efficacious; in fact, the author considers it applicable in all cases where the Listerian mode of treatment is adopted, and that it ought eventually to replace carbolic acid for this purpose, seeing that it does not give off any disagreeable smell, the odour of camphor being to most persons a pleasant one, besides which it has the still greater advantage of being neither a poison nor an irritant.

Relative Merits of Salicin and Salicylic Acid as Medicinal Agents. Dr. Maclagan. (*Lancet*, January 14th, 1882.) The

author points out that while salicin is equally powerful with salicylic acid and salicylate of sodium as an anti-rheumatic, it produces none of the deleterious effects of the salicylates. In the statistics which he has published not a single reference is made to any ill effects following the use of salicin, while salicylates are frequently said to produce bad results.

With reference to the deleterious effects of salicylic acid, it should be borne in mind that repeated observations by different investigators tend to show that in the majority of cases, if not in all, these effects are peculiar to the artificially prepared acid, and do not belong to the natural product. This experience is again confirmed in a recent contribution to the *British Medical Journal* by Dr. P. W. Latham.—(Ed. of the *Year-Book.*)

Preservation of Food by means of Salicylic Acid. (*Pharmaceut. Zeitung*, 1881, 511.) The French minister of commerce has issued a decree prohibiting the sale of articles of food containing an admixture of salicylic acid, in consequence of an unfavourable report received from the committee charged to investigate the subject from a sanitary point of view. The report states that the proportion of salicylic acid required and actually employed to prevent decomposition in food, is not so small as is alleged by the vendors of preserved food, and is large enough to produce an injurious effect on the health of delicate persons. The prevailing supposition that salicylic acid is very readily and completely eliminated by the kidneys is called in question by the committee, especially in the case of old people and of those troubled with kidney affections, stone, or gout. The report further sets forth that salicylic acid is a medicinal agent, and that its administration should therefore be under the control of qualified practitioners.

Antiseptic Action of Salicylic Aldehyde. P. Apery. (*Amer. Journ. of Pharm.*, 1882, 16.) Salicylic aldehyde occurs in various species of *Spiræa*, and may be artificially obtained by distilling a measure of 10 parts of salicin, 10 parts of potassium bichromate, 25 of sulphuric acid, and 200 of water. The author finds that meat may be kept in an aqueous solution of this compound without putrefying, and that a few drops of the oil will preserve wine.

Salicylate of Soda as an External Remedy. Dr. C. Orton. (*Brit. Med. Journ.*, January 7, 1882.) The author reports that salicylate of soda when applied on lint soaked in its solution, gives great and speedy relief to swollen and tender joints, after many other local applications had failed.

Salicylated Opodeldoc. (*Pharmaceut. Zeitung*, 1881, 771.) The *Farmacisca Italiano* publishes the following formula:—

Soap	100 parts.
Camphor	25 „
Alcohol	500 „
Oil of Thyme	5 „
Oil of Rosemary	8 „
Liquor Ammoniac	50 „
Salicylic Acid	10 „

Salicylated Camphor. M. Prota-Giurleo. (*Annali di Chim.*, October, 1881, 193. From *Pharm. Journ.*) The author describes a preparation, named salicylated camphor, which is said to have been used with success in the form of ointment in the treatment of lupus and rodent ulcers. It is prepared in the dry way by heating 84 parts by weight of refined camphor in a porcelain capsule in a water-bath to a temperature of 90° C., and then adding 65 parts of salicylic acid. The camphor immediately liquefies and the acid disappears, a very limpid homogeneous liquid being formed, having the density of glycerin, which, upon the lowering of the temperature a few degrees, solidifies to an opaque crystalline mass that takes an unctuous condition when rubbed with a pestle. The compound has a piquant, slightly bitter taste, leaving upon the tongue a suggestion of peppermint. It is soluble in water, glycerin, and in many fixed and volatile oils. Salicylated camphor may also be obtained in fine crystals grouped round a common centre by adding 84 parts of camphor to a suitable quantity of benzene in a flask, heating in a water-bath until the liquid boils, then adding 75 parts of salicylic acid, continuing the heat until the disappearance of the acid, filtering whilst hot, and leaving to crystallize.

Gossipium Ærophorum (Ærated Cotton). (*New Remedies*, Jan., 1882, from the non-official formulary of the Dutch Society for the Advancement of Pharmacy.)

Purified Cotton	q.s.
Citric Acid	19
Bicarbonate of Sodium	25
Distilled Water	q.s.

Dissolve the citric acid in 250 parts of distilled water, and saturate with the solution a suitable quantity of cotton.

Also dissolve the bicarbonate of sodium in 250 parts of water, and saturate with it another lot of cotton of the same weight.

Dry each lot separately, then mix the two lots and preserve them in glass-stoppered bottles.

Carbolic Disinfecting Powder. (*Berlin Klin. Wochenschr.*) A dry powder containing a definite quantity of carbolic acid, in which form the latter is most easily used as an antiseptic, is prepared, according to Bruns, as follows:—60 parts of resin and 15 parts of stearin are melted together with a gentle heat, and when the mass has somewhat cooled, but is still liquid, 25 parts of carbolic acid are added. The mixture is then mixed with 700 to 800 parts of precipitated carbonate of calcium, and by careful trituration, reduced to a uniform powder. The powder is applied by means of a sprinkling box, which may be securely covered after use.

The powder may be applied either directly to wounds and sores, so as to produce an antiseptic scab, or it may be used for the extempore preparation of carbolized jute dressing, by placing several layers of jute, each separately dusted over with the powder, upon each other.

Liquor Sodæ Carbolatis. (*New Remedies*, April, 1882.)

Carbolic Acid	5 parts.
Solution of Soda (sp. gr. 1·330) . . .	1 ,,
Distilled Water	4 ,,

Mix them.

A clear liquid of an alkaline reaction, a specific gravity of 1·060 to 1·065, and miscible with water and alcohol in all proportions.

It should be freshly prepared when wanted for use.

Antiseptic Properties of Basic Magnesium Acetate. (*Pharm. Journ.*, 3rd series, xii., 884.) When a hot aqueous solution of magnesium acetate is treated with excess of magnesia, it is converted into a basic salt, similarly to the formation of basic lead acetate from lead acetate. According to Herr Kubel (*Berichte*, xv., 684), this basic acetate of magnesium possesses antiseptic, disinfecting and deodorizing properties in a high degree, preserving albumen, flesh, and other readily decomposing substances, and quickly removing the smell from putrid cheese or urine. It is said to be equally efficacious with the malodorous sweat of feet or the armpit, and it is recommended as an advantageous and innocuous agent for the purpose. A thickish solution of basic magnesium acetate, which is turbid through the presence of undissolved magnesium hydrate, is alleged to be met with in commerce under the name of "sinodor."

Potassium Permanganate as an Antidote to Snake Poison. M. Vulpian. (*Comptes Rendus*, xciv., 613.) The alleged value of solution of potassium permanganate as a remedy for snake bite is

called in question by the author on the strength of experiments made by him on dogs, proving that the salt is decomposed immediately after being injected. He thinks that such a solution could be of little service except in very recent bites, and that the hypodermic application of permanganate may itself produce serious effects. M. Couty (*Ibid.*, p. 1198) arrives at similar conclusions.

Boroglyceride, A New Antiseptic. Prof. Barff. (*Journ. Soc. Arts*, March 31st, 1882.) This compound is prepared by heating together boracic acid and glycerine, in the proportion of 62 parts of the former to 92 of the latter, and is stated to possess remarkable antiseptic properties. It is said to be of special value for the preservation of articles of food.

Prevention of Rot in Potatoes. M. Rohl and G. v. Hess. (*Bied. Centr.*, 1881, 212. From *Journ. Chem. Soc.*) The tubers, whether sound or diseased, when taken from the ground, are left in a weak solution of calcium chloride, 1 part to 1,000 of water, for half an hour; they are then transferred to a soda solution of the same strength, after which they are washed in clean water, and air dried. Half a kilo. of calcium chloride, and the same quantity of soda is sufficient for 250 kilos. of potatoes.

Preventive of Lead Poisoning. Dr. W. A. Johnston. (*Chem. and Drugg.*, 1881, 431.) The author sends a communication to the *Lancet*, recommending the following as a mixture for free use among workmen exposed to lead poisoning, which has, in his experience, answered better than any other drink:—

Sulphate of Magnesia . . .	10–30 grains.
Dilute Sulphuric Acid . . .	½–3 minims.
Spirit of Nitrous Ether . . .	1–4 "
Water	½ ounce.

To be taken every two or three hours while exposed to the lead. In the works where he practised, he says, before this mixture was used there were from one to twenty cases of lead poisoning daily, but subsequently no case occurred for the six weeks during which he provided the medicine.

Cotton-seed Oil as a Substitute for Olive Oil. E. Scheibe. (*Chem. Centr.*, 1881, 703.) The author has examined a sample of pure cotton-seed oil, and finds it suitable for many purposes for which olive oil is used. The oil at ordinary temperatures is clear, transparent, and of a golden-yellow colour, of mild taste and without smell, sp. gr. = 0·923. The oil does not belong to the *drying* class, although it gives imperfectly the nitrous acid reaction (elaidic

acid test); it does not, however, give a green coloration with acids or alkalies: with concentrated sulphuric acid it gives a dark-brown coloration. It solidifies at 1°, is readily saponified with caustic alkalies or lead oxide; with ammonia it forms a good liniment. Towards solvents (ether, benzene, etc.) it behaves as *salad oil.*

From these properties it is easy to sophisticate commercial *salad oil* with the cheaper cotton-seed oil, or even to substitute the one for the other; but the presence of the latter is revealed by the imperfect elaidic acid reaction, its sp. gr., its solidifying point, and its ready and complete solidification. For other modes of detecting this sophistication, see this volume, p. 216.

Recovering Glycerin from Spent Soap Leys. H. Fleming. (*Dingl. polyt., Journ.*, ccxliii., 330–333.) The author proposes to subject the spent leys to dialysis. He shows that the four soap works at Neuwied alone produce annually about 1,500 tons of waste liquors containing about 75 tons of glycerin. The percentage of glycerin in the leys varies from 0·92–7·8, and in order to recover the same by distillation, it is necessary to remove the salt contained therein. The most effectual means of doing this is to subject the leys to osmotic action. The leys are concentrated in suitable pans with steam heat, and then neutralized with sulphuric acid. The quantity of acid required depends upon the amount of sodium carbonate present in the leys. As owing to the violent evolution of carbonic acid it is difficult to obtain a perfectly neutral solution, it is preferable to add a slight excess of acid which, after the precipitation and separation of the sodium sulphate, is removed by lime. The liquor is re-evaporated with steam, a further (small) quantity of sodium sulphate and chloride crystallizing out on cooling. It is now osmosed, and leaves the osmometer sufficiently free from ash constituents to be distilled after concentration, either *per se* or in conjunction with crude glycerin obtained in the manufacture of stearic acid. The loss of glycerin by distillation is very small, and as to the purity of the resulting product, it is shown that it fulfils all the requirements necessary for the successful preparation of dynamite. The great feature of the process is that, unlike molasses, the liquor treated does not attack parchment paper. A large quantity of glycerin remains in the osmose water, which may be recovered by concentrating and distilling the liquid.

Preparation of Purified Oleic Acid. (*Chem. Centr.*, 1881, 14.) 60 parts of oil soap are dissolved in four times as much boiling water, decomposed by 10 parts sulphuric acid, and boiled until the separation of the oleic acid is complete; this is washed with hot

water, and 4 parts of lead oxide are then dissolved in the oleic acid, and to the still hot fluid are added 60 parts of alcohol (0·820) heated to 65°. After twenty-four hours digestion, the residue is well pressed and decomposed by 1 part of hydrochloric acid, the oleic acid repeatedly washed with water, and finally filtered. The yield is about 30 parts of purified oleic acid of bright yellow colour, and with but a faint smell of olive oil; its sp. gr. is 0·897.

Oleates and Oleo-Palmitates. Dr. L. Wolff. (From a paper read before the Philadelphia College of Pharmacy. October 18th, 1881, and published in the *Amer. Journ. of Pharm.*, Nov., 1881.) The fact that these preparations have hitherto not met with as much favour as they deserve is attributed by the author to the unsatisfactory processes by which most of them are usually made. The general process recommended by him for obtaining good oleates is as follows:—1 part of castile soap (sodium oleo-palmitate) is dissolved in 8 parts of water, the solution so obtained is allowed to cool and stand for twenty-four hours, when there will be a considerable deposit of sodium palmitate; while the supernatant liquor, containing mostly sodium oleate, is drawn off and then decomposed with a concentrated solution of a metallic salt which, if obtainable, should contain no free acid to prevent the formation of free oleo-palmitic acid. The heavy deposit of oleo-palmitate so derived is strained off, pressed out in the strainer, and the adherent water evaporated in a water-bath; after this it is dissolved in about six to eight times its quantity of petroleum benzin, and the insoluble palmitate is left to subside while the solution of oleate decanted therefrom is filtered off. The benzin evaporated will yield an oleate that is entitled to that name, as it is a chemical combination and will remain stable and efficacious.

The oleates, so prepared, present an amorphous appearance, while the palmitates are of a crystalline character. While a marked affinity of some of the metallic salts for palmitic acid may be noticed, the absence of it in others is remarkable. Thus, mercury, zinc, bismuth, and lead combine with palmitic acid abundantly, but iron and copper seem to form an exception; and while the oleates of mercury, iron, and copper seem to be desirable as thereapeutic agents, the oleo-palmitates of zinc, bismuth, and lead, appear preferable. The oleo-palmitate of zinc is a pulverulent substance, imparting a greasy touch, not unlike that of powdered soapstone, will readily dissolve in warm oils, cosmolin, etc., imparting to them a semi-diaphanous appearance on cooling. One part dissolved in five of cosmolin makes an excellent ointment of zinc oleate, for

the treatment of eczema and other skin affections. Applied dry to excoriated and erythematous surfaces, it acts mechanically by relieving friction, and by its astringent properties it helps to correct and heal the parts. It is prepared by precipitating the soap solution with zinc sulphate.

The oleo-palmitate of bismuth is of an unctuous consistence, and has yielded very good results in chronic skin affections where an alterative action seems desirable. To prepare it, the solution of soap was decomposed by a glycerin solution of the crystallized nitrate of bismuth.

The oleo-palmitate of lead is nothing more than the lead plaster of old, but it is free from glycerin, beautifully white, and dissolved in olive oil makes a litharge ointment more elegant and quicker than the recently proposed process of precipitating the hydrated oxide of lead from the basic lead acetate solution, and saponifying it with olive oil in the presence of water. It affords also a very excellent substitute for the old lead plaster, and can readily be made in a very short time at an expense not exceeding that of the old method. It is best prepared by precipitating the soap solution with the officinal solution of lead subacetate.

The oleate of mercury is well known for its therapeutic application; it should be diluted with cosmolin, unless it is needed to make a marked mercurial impression. It should be prepared by precipitating the soap solution by a concentrated watery solution of mercuric chloride. The precipitate so formed should be heated to the boiling point to insure its subsidence. It is then deprived of its water in a water-bath, dissolved in benzin, and filtered, and the filtrate left to evaporate.

The oleate of copper is not yet in use, but would, if diluted with oil or cosmolin, make an excellent stimulant application to indolent ulcers, lupus, etc. The soap solution, precipitated with a solution of cupric sulphate, yields it readily.

The oleate of iron has not yet found any use, though in the formulæ proposed for ferrated cod-liver oil this is evidently formed. That a definite quantity of it dissolved in cod-liver oil would serve quite as well, seems obvious, though its odour and taste is objectionable. The author prepares it by precipitating the soap solution with a solution of ferrous sulphate, but finds that from the ferrous condition the new-formed salt readily changes to the ferric state.

Unguentum Hydrargyri Nitratis, B. P. R. Singleton. (*Pharm. Journ.*, 3rd series, xii., 396.) The author points out that the purity of the olive oil to be used for this ointment is an

essential condition for obtaining a satisfactory product of the proper colour. Made with impure olive oil, the ointment is usually orange instead of a nice straw colour. He suggests that the oil intended for this purpose should always be tested in order to ascertain its purity. Processes for testing it will be found in the *Year-Book of Pharmacy*, 1881, p. 129, and this volume, p. 216.

Improved Diachylon Ointment. Prof. Duhring. (*Medical Times and Gazette.*) The following formula is suggested as superior to that of Hebra's:—1 part of freshly precipitated lead hydrate is stirred into 2 parts of water, and mixed well with 6 parts of the best olive oil. The mixture is heated for two hours on a water-bath to near the boiling point, and then allowed to cool, the stirring being continued all the time. When nearly cool it is perfumed by the addition of a drachm of oil of lavender to every half pound of ointment. The product is perfectly neutral, and can be kept in good condition for a long time.

Ointment for Removing Freckles. (*Oil and Drug News.*)

Oil of Almonds, expressed	4 ounces.
Lard	3 ,,
Spermaceti	1 ,,
Expressed juice of Houseleek	3 fl. ounces.

Melt the spermaceti and lard together; add the oil, and then the juice, and stir the mixture until it solidifies on cooling. A few drops of some perfume may be added.

Trochisci Disinfectatorii. H. Hager. (*Pharmaceut. Centralhalle*, iii., 26.) These lozenges, intended for the use of medical men and others in attendance upon diphtheritic patients, are made according to the following formula:—

℞ Ceræ Flavæ	partes 20
Colophonii	,, 6

Mixtis et leni calore fusis imisci

Balsami Tolutani	partes 10
Pulveris Aromatici	,, 5·0
Sacchari alb.	,, 20
Acidi Benzoici	partes 7·5–10

in pulverem redacta et aromatisata addendo

Olei Neroli	gutt. 5
Olei Cinnamoni	,, 10
Creosoti veri	partes 2·5

Massam semirefrigeratam in troch. 100 redige. D. ad vitrum.

Each pastille should be chewed for half an hour, and the con-

stituents should be only slowly dissolved by the saliva. Four or five pastilles daily are sufficient for adults, and half a pastille for children.

Troches of Borax. F. Vigier. (*Répert. de Pharm.*, 1882, 59.) The usual mode of preparing lozenges by the aid of gum arabic or powdered tragacanth is not applicable in this case, as these gums form with borax a mass which it is exceedingly difficult to divide. The author recommends the following process:—

℞	Borax	100	grams.
	Powdered Sugar	900	„
	Carmine	0·15	„
	Tragacanth, in flakes	2·50	„
	Distilled Water	60	„
	Tincture of Benzoine (Siam) . .	10	„

Prepare a mucilage from the tragacanth, and one-half each of the water and tincture. Mix the sugar with the carmine, and add one-half of this sugar in small quantities to the mucilage; then add the remainder of the water and tincture, and with this mixture incorporate the powdered borax and remainder of the sugar, previously thoroughly mixed. Divide the mass into troches, each weighing one gram, and containing 0·10 gram of borax.

These troches have been used with good success in various affections of the mouth.

Palatable Laxative Lozenges. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, Sept., 1881.) After having washed some dried prunes, place them in a saucepan over a dull fire or on a sand-bath, with just sufficient water to nearly cover them; when they have boiled long enough to become quite soft, and the greater part of the water has been evaporated, allow them to cool and rub them in a large mortar, so as to crush the fruit but not the stones. Transfer them to a coarse straining cloth and squeeze the pulp through it. This should be about the consistence of honey in the winter. If not, it can be made so by evaporating it over a water-bath. This prune paste is made into a suitable mass with the compound liquoric powder of the German Pharmacopœia, and this mass divided into lozenges weighing about half a drachm each. One or two of these lozenges will produce a mild aperient action.

As another formula, the following is recommended:—

Pulverized Senna Leaves . . .	4 ounces.
„ Sugar	4 „
„ Jalap	½ ounce.
„ Gum Arabic . . .	6 drams.
Aromatic Powder	6 „

Prune paste, sufficient quantity to make a mass, and divide into large troches.

An Effervescing Powder of Rochelle and Epsom Salts. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, Sept., 1881.) A considerable proportion of magnesium sulphate can be added to the potassium and sodium tartrates and taken as an effervescing draught without the disagreeable bitterness of the former being perceptible. Preparations of this character having come largely into use, the author publishes the following formula :—

℞ Potassii et Sodii Tartrat.	5 lb. 10 ounces.
Sodii Bicarbonatis	2 lb. 14 „
Acidi Tartarici	2 lb. 8½ „
Magnesii Sulphatis	1 lb. 9 „

The quantities here named are in avoirdupois weight.

The articles used should be spread upon shallow trays and left in a drying closet for about two or three days, at a temperature between 90° and 120° F., then, when perfectly free from moisture, should be triturated separately through a sieve (No. 40), and all the ingredients thoroughly mixed. The compound should be put up in well-stoppered bottles, and as thus prepared will keep for any length of time.

Purgative Powder. (*New Remedies*, 182, 118.)

Extract of Jalap, powdered	24 parts.
Bitartrate of Potassium.	24 „
Resin of Podophyllum	1 part.
Ginger, powdered	12 parts.
Cinnamon, powdered	12 „
Nutmeg, powdered	3 „
Sugar of Milk, powdered	48 „
Sugar, powdered	96 „

Triturate the resin of podophyllum with the sugar of milk for fifteen minutes; then add the other ingredients, and mix thoroughly. Keep the mixture in well-corked bottles. Dose: one teaspoonful.

Crotonized Ether. (*New Remedies*, 1882, 118.)

Croton Oil	1 fl. drachm.
Ether	1 fl. ounce.

Dose: twenty drops in an ounce of cold water with a little sugar, to be repeated in an hour, if necessary. Recommended as a remedy for habitual costiveness.

Ferrand's Laxative Electuary. (*L'Abeille Méd.*, 1881, 24.) This preparation is composed of 30 grams of flake manna, 4 grams of

calcined magnesia, and 30 grams of clarified honey. It is used at the Laennec hospital for phthisical patients, and is given in doses of a tablespoonful before breakfast.

Tænifuge Electuary for Children. C. S. von Cadenberg. (*Pharm. Centralhalle*, 1881, 284.) The author recommends the following:—Pumpkin seeds, deprived of their testa (30 grams), are beaten with water (3 grams) until a pulpy mass is obtained, which is mixed with honey (30 grams). It is to be taken in the morning in two doses, to be followed after several hours with 15 grams of castor oil.

Mistura Anticatarrhalis (Hufeland's Catarrh Mixture). (*New Remedies*, April, 1882.)

Extract of Carduus Benedictus . .	3 parts.
Extract of Dulcamara	1 ,,
Fennel Water	24 ,,
Cherry-laurel Water	3 ,,

Mix them.

N.B.—Extract of carduus benedictus and extract of dulcamara are prepared thus: pour as much boiling water upon the finely-cut plants (dry or fresh) as is required to make a pulp, set aside for twenty-four hours, occasionally stirring, then express. Again pour on a somewhat smaller quantity of boiling water, let stand twelve hours, and express. Evaporate the united liquids to a thick extract.

Infusum Cinchonæ Rubræ. (*New Remedies*, April, 1882.)

Red Cinchona Bark, in fine powder .	15 parts.
Normal Hydrochloric Acid . . .	5 ,,
Water to make 200.	

Macerate the cinchona with the acid and a little water for several hours, occasionally stirring, until the froth has disappeared. Pour the mixture into a percolator closed with a linen pellet at the bottom. As soon as the liquid begins to run clear, pour water on the top until 200 parts of filtered liquid are obtained.

The infusion is clear, of a reddish yellow colour, and should yield a copious precipitate, both with solution of soda and with strong hydrochloric acid.

Vinum Condurango. Dr. A. Hoffmann. (*Schweiz. Woch. für Pharm.*, 1882, No. 4.) The author again calls attention to condurango of Ecuador as a useful remedy in cancer. Of twenty cases treated with it, improvement was noticed in 40 per cent., uncured 10 per cent., and died 50 per cent. The most advantageous form of administration was the wine, prepared as follows: $2\frac{1}{2}$ kilos. of

coarsely powdered condurango bark are macerated for 2 days in 10 litres of cold water, and the infusion strained; the residue is again mixed with ten litres of cold water, boiled for an hour, allowed to cool, and again strained; the residue is treated for 2 days with 5 litres of alcohol, expressed, the alcohol distilled off, the residuary liquid mixed with the aqueous liquids and the whole evaporated to the consistence of an extract, which is to be dissolved in 2½ litres of Malaga wine, decanted from the sediment, and filtered. This preparation has an agreeable bitter taste, and is readily taken by the patients. Prepared with condurango from Venezuela, however, it has an acrid, peppery taste, and is either not taken by the patients or does not agree with them.

Elixir Viscerale (Klein's Stomachic Elixir). (*New Remedies*, January, 1882, from the non-official Formulary of the Dutch Society for the Advancement of Pharmacy.)

Extract of Carduus Benedictus	1 part.
Extract of Erythrea Centaurium	1 "
Extract of Gentian	1 "
Tincture of Orange Peel	20 "
Malaga	32 "

Extractum Ergotæ Dialysatum. (*New Remedies*, January, 1882, from the non-official Formulary of the Dutch Society for the Advancement of Pharmacy.)

Ergot, in powder, and freed from Oil of Ergot	5 parts.
Distilled Water	q.s. "

Mix the ergot with 15 parts of the water, and let it stand for twenty-four hours, frequently stirring. Then transfer it to a densely-woven, moistened strainer, and pour the strainings back until they run off completely clear. Let all the liquid drain off, then pour upon the residue distilled water until the strained liquid is almost colourless and tasteless. Evaporate the more concentrated first part of the strained liquid at once on the water-bath to the consistence of thin syrup, and also bring the more dilute second part to the same condition as quickly as possible. Unite the residues and evaporate the mixture on the water-bath until it amounts to 6 parts.

Transfer this to a dialyser, and continue the dialysis with distilled water until no more passes through the membrane. Then evaporate the dialysed liquid (that is the distilled water containing the crystalloids, etc., in solution) on a water-bath to a *thin* extract.

Fluid Extract and Syrup of Wild Cherry. J. B. Moore. (*Pharm. Journ.*, 3rd series, xii., 87.) The author recommends the following improved formula:—

Powdered Wild Cherry Bark . .	16 troy ounces.
Glycerin	of each sufficient.
Warm Water, temperature 130° F.	
Strong Alcohol	
Water	

Moisten the powdered wild cherry with 12 fluid ounces of a mixture consisting of 11 fluid ounces of water, temperature 130° F., and 3 fluid ounces of glycerin; pack the powdered bark in a bottle and close it, then set it aside in a moderately warm place to macerate for four days. Then pack firmly in a glass cylindrical percolator, and pour upon it first the remainder of the menstruum, and when this has passed through, pour gradually upon it 27 fluid ounces of a mixture consisting of 7½ fluid ounces each of glycerin and strong alcohol, and 12 fluid ounces of water; and when this has all been absorbed, continue the percolation with water until 32 fluid ounces of percolate are obtained.

Syrup.—When the fluid extract is mixed with syrup alone it is apt to be a little cloudy and to deposit a sediment, but when a little glycerin is added, this holds the resinous matter in solution, and forms not only a clear syrup, but one that will keep unchanged for a long time. The author therefore offers the following formula:—

Fluid Extract of Wild Cherry . .	5 fl. oz.
Glycerin	2 ,,
Syrup (fresh)	9 ,,

Mix the fluid extract with the glycerin, and add the mixture to the syrup in a suitable bottle and mix well. The proportion of glycerin in this formula may be increased if desired, probably with advantage. The author has given the minimum quantity that will form a clear syrup, and which will keep well for several months without change.

Compound Syrup of Tar. (*New Remedies*, April, 1882.)

Oil of Tar	1 drachm.
Fluid Extract of Ipecac. . . .	4 drachms.
Tincture of Opium.	4 ,,
Fluid Extract of Wild Cherry . .	6 ,,
Carbonate of Magnesium . . .	3 ,,
Water	8 fl. oz.
Sugar	14 ,,

Triturate the oil thoroughly with the magnesia in a mortar, mix the fluid extract with the water, and incorporate with the mixture in the mortar; then filter, and in the liquid dissolve the sugar by agitation.

Syrup of Chloral. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, Sept., 1881.) It is a difficult matter to cover the peculiar acid taste of chloral, but the author has found this difficulty overcome to a considerable extent in the following formula:—

℞ Chloral. Hydr. Cryst. . . .	ʒi grs. xx.
Aquæ Menth. Pip.	fʒiij.
Curaçoa Cordial	fʒiv.
Syrup. Acaciæ . . . . q. s. ut ft.	fʒij.

Syrupus Ferri Bromidi. (*New Remedies*, April, 1882.)

Iron, in powder	1 part.
Bromine	2 parts.
Sugar	15 „
Distilled Water	q. s.

Put the iron into a flask, pour upon it 10 parts of distilled water, and add to it the bromine in small quantities at a time, and under constant agitation. Filter the light-green liquid into a flask containing the sugar, and wash the filter with sufficient distilled water to make the contents of the flask weigh 27 parts. Finally dissolve the sugar by agitation, and preserve it in small well-closed vials.

The syrup has a light-green colour, and contains 10 per cent. of ferrous bromide.

Syrupus Eucalypti. (*New Remedies*, April, 1882.)

Eucalyptus Leaves	5 parts.
Sugar	20 „
Water	q. s.

Pour 50 parts of boiling water upon the eucalyptus, let it macerate for one hour, then strain and express.

For every 12 parts of liquid so obtained, add 20 parts of sugar, and dissolve.

Improved Mode of Preparing Syrup of Violets. C. Bernbeck. (*Chem. Centr.*, 1881, 448.) 100 grams of violet flowers are macerated with 50 grams of alcohol. After digesting the mixture for eight hours, it is pressed, and the liquor made up to 100 grams by the addition of water. It is then filtered and mixed with nine times its weight of strong simple syrup.

Soluble Phosphate of Iron. L. Dohme. (*Chem. and Drugg.*, from a paper read at the twenty-ninth annual meeting of the

American Pharmaceutical Association.) This paper suggests the use, in place of the insoluble slate-blue powder of phosphate of iron now in use, of a soluble scale salt, which is as soluble, stable, and tasteless as the pyrophosphate of iron. Two formulæ were given for the preparation, one producing the ordinary phosphate by precipitation, and dissolving the washed precipitate by means of citrate of sodium. The simpler method of preparing it from admixture of the definite salts is appended.

Citrate of Iron	6 parts.
Phosphate of Sodium (pure)	7 ,,
Distilled Water	q. s.

Dissolve the citrate of iron in 12 parts of water by heating in a water-bath. To this solution add the phosphate of sodium, and stir constantly until dissolved. Evaporate, at a temperature not above 140° F., to the consistence of a thick syrup, and spread on plates of glass, so that the salt when dry may be obtained in scales. This salt contains 12 per cent. of iron, is definite in its composition, and both therapeutically and pharmaceutically is satisfactory to all who have used it.

Albuminated Ferrous Borotartrate. C. Pavesi. (*Annali di Chimica*, January, 1882. From *Pharm. Journ.*) The author gives the following process for preparing the above salt, which is stated not only to possess sedative properties, but to act also as an antiseptic and antifermentative. According to the author, its chemical composition is that of an albuminated borotartrate of protoxide of iron.

Pure and fine Iron Filings	2 parts.
Boric Acid, in fine powder	1 ,,
Tartaric Acid, in fine powder	1 ,,
Fresh Egg Albumen	6 ,,
Water	q. s.

Throw the two acids into a suitable porcelain capsule, and then the iron filings, adding sufficient water to convert the whole into a liquid. The mixture is heated to a temperature which gradually increases from 176° F. to 212° F., at which point the capsule is taken off the fire and the mixture is allowed to cool. The albumen is then added, and the whole well mixed until it is reduced to a homogeneous mass. It is then set aside for a week in a place where the temperature does not exceed 76° F., the mixture being stirred from time to time so as to ensure the chemical combination of the tartaric and boric acids, and the albumen. At the end of this

time the mixture is filtered through bibulous paper, more water being added if necessary, to render the filtration less difficult. The liquor thus obtained is then submitted to a heat that must not exceed 95° F., for fear of coagulating the albumen. The solution being evaporated to dryness, the residue is finely powdered and kept in well-stoppered bottles.

The principal characteristics of albuminated ferrous borotartrate are described as follows:—It forms a light straw-coloured powder of a not disagreeable taste, which does not possess the styptic flavour of so many other preparations of iron; it is inodorous and soluble in water; treated with liquor ammoniæ, or with potash or soda, no decomposition takes place, and no precipitate is thrown down, an important property which merits the attention of prescribers. With tannic acid and potassium sulphide it gives a black precipitate, and with potassium cyanide a blue precipitate; while the addition of strong acids separates the boric acid and the albumen.

It is claimed by the author that the ferrous borotartrate being in union with the albumen of this compound will, when it is introduced into the system, be speedily absorbed by the mucous membrane of the stomach, and carried into the blood without being previously decomposed; and that finding itself in contact with the sodium albuminate contained in the blood, a new salt of soda and albuminate of iron will be produced, which is the true basis of the blood.

The author observes that the two acids, boric and tartaric, being well united by the aid of the water, form soluble borotartaric acid, which, coming into contact with the finely divided iron and albumen, produces a salt with a duplicated acid. This salt, he considers, as possessing the important therapeutical properties of its components, and having a taste that is far from disagreeable, ought, when opportunely administered, to be of the greatest service in clinical medicine.

Dr. Cazzatino, of Naples, has experimented on potassic ferrotartrate for external use, especially in the cases of ulcers with a retrogressive tendency, as well as phagedenic, atonic, gangrenous, and syphilitic sores. Dr. Cazzatino has obtained very decided results in such cases, for which reason he hopes to obtain similar results with the albuminated borotartrate of the sesquioxide of iron in cancerous and other ulcers, by soothing the pain, disinfecting the sores, and promoting granulation and ultimate cicatrization.

The ferrous borotartrate, united with albumen, is said to constitute

a salt with a double acid, having an action *sui generis*, which when introduced into the system by the stomach does not disagree with persons even of the most delicate constitution, besides being soluble in water without undergoing decomposition.

The author concludes by recommending the salts of manganese to be used in conjunction with those of iron in cases of anæmia and other disorders where martial preparations are indicated.

Ammoniacal Peptonate of Iron. MM. Jaillet and Quillart. (*Répertoire de Pharm.*, December, 1881. From *Pharm. Journ.*) A solution of ammoniacal peptonate of iron, capable of being injected upon the skin without causing inconvenience, may be obtained by the following method.

The two following solutions are first prepared separately:—

1	Dry Peptone	5 grams.
	Distilled Water	50 ,,
2	Ammonium Chloride	5 ,,
	Distilled Water	50 ,,

Twelve grams of official solution of perchloride of iron, *chemically neutral*, is poured into the solution of peptone; a coagulum is formed which is dissolved by adding the solution of ammonium chloride. Finally, add 75 grams of neutral glycerin in sufficient distilled water to produce 200 c.c. of mixture, which is made slightly alkaline by the addition of several drops of ammonia.

After filtration a preparation of perfectly dialysable peptonate of iron is obtained, which represents five milligrams of metallic iron to each c.c.

It is interesting to notice that the peptonate formed, even in a neutral condition, does not give a precipitate of Prussian blue with ferrocyanide of potash, and that it is sufficient to add two or three drops of hydrochloric acid to produce this reaction immediately; this probably is due to a decomposition of the peptonate of iron.

Compound Solution of the Hypophosphites of Iron, Soda, Lime, and Magnesia. A. Gibson. (From a paper read before the North British Branch of the Pharmaceutical Society, Jan. 11th, 1882, and published in the *Pharm. Journ.*, 3rd series, xii., 603, 604.) For the preparation of such a solution of definite strength, the author gives the following process:—

Dissolve the whole of the calcium hypophosphite required to decompose the sulphates (6 ounces 112 grains) in 50 ounces of water; bring the solution nearly to boiling point, and acidify with half an ounce of the hypophosphorous acid; then stir in the

ferrous, sodium, and magnesium sulphates; double decomposition ensues almost immediately. After stirring two or three minutes, throw the whole on a paper filter, and wash the precipitate with hot water to 70 ounces.

Dissolve the 3 ounces 368 grains calcium hypophosphite in 25 ounces of water; filter, mix the filtrates, add to the solution the remaining 5 ounces of hypophosphorous acid, and make up with water to 100 ounces.

During a few days after its preparation it deposits a minute quantity of calcium sulphate, from which, however, it may wholly be freed by decantation or filtration.

This forms a clear and permanent solution. It may be mixed with simple syrup, claret, and glycerin in any proportions, but the salts are gradually deposited from mixtures containing an appreciable percentage of alcohol.

Soluble Saccharated Peroxide of Iron. Dr. Brunnengraeber. (*Archiv der Pharm.*, 1882, 289.) The author has furnished the following formula for the new German Pharmacopœia:—Dissolve powdered sugar 9 parts in water 9 parts; add solution of ferric chloride (sp. gr. 1·280 to 1·282, containing 10 per cent. iron), 30 parts; afterwards, gradually and with continued stirring, a solution, prepared with heat and allowed to cool, of sodium carbonate 24 parts, in water 48 parts. When the evolution of carbonic acid gas has ceased, add gradually caustic soda solution (sp. gr. 1·159 to 1·163, containing 15 per cent. of $NaOH$), 24 parts. When clear, add to the liquid sodium bicarbonate 9 parts, and dilute at once with boiling water 600 parts, set aside, remove the clear liquid with a syphon, mix the precipitate twice with boiling water 400 parts; after subsidence syphon off the liquid; finally collect the precipitate upon a moist strainer, wash it with hot water until the filtrate is not precipitated, but merely rendered opalescent with silver nitrate, and express. Mix the precipitate in a porcelain dish with powdered sugar 50 parts, evaporate in a steam-bath to dryness, stirring constantly, and triturate the residue with sufficient sugar to make the weight equal to 100 parts.

It is a red-brown powder of a sweet, ferruginous taste, contains 3 per cent. of iron, and yields with 20 parts of hot water a clear red-brown solution which is not altered by potassium ferrocyanide, but on the further addition of hydrochloric acid yields at first a dingy green, afterwards a blue precipitate. If 2 grams of the powder are ignited, the residue treated with boiling hydrochloric acid, the filtrate oxidized with potassium chlorate and heating, and

the cold liquid mixed with 1 gram of potassium iodide, and digested for an hour in a stoppered bottle, the mixture, in the presence of a little solution of iodide of starch, must require from 10 to 10·7 c.c. of tenth normal solution of sodium thiosulphate to combine with the separated iodine.

Enemata of Peptones. M. Henninger. (*Brit. Medic. Journ.*, Sept., 1881.) The author gives the following formula for enemata of peptones. Five hundred grams of very lean meat, minced fine, are placed in a glass receiver, on which are poured 3 litres of water and 30 cubic centimetres of hydrochloric acid of density 1·15; to this is added $2\frac{1}{2}$ grams of the pure pepsine of commerce, at the maximum of activity, that is to say, digesting about two hundred times its weight of moist fibrine. It is left to digest during twenty-four hours at a temperature of 45° C. (113° F.), either in a water-bath or a stove; it is then decanted into a porcelain capsule, brought to boiling point; and, whilst the liquid boils, an alkaline solution is poured into it (250 grams of carbonate of soda to 1000 grams of water), until it shows a very slight alkaline reaction. About 165 to 170 cubic centimetres of this solution must be added to it. When the result is obtained, the boiling liquid is passed through a fine linen cloth, the insoluble residue being expressed; and this liquid, which amounts to about $2\frac{1}{2}$ litres (3 pints), is reduced in the water-bath to 1,500 or 1,800 cubic centimetres. Half of it is administered every day in three enemata, adding 200 grams of white sugar for the twenty-four hours. The whole of the meat is not dissolved; the fat, the tendons, the connective and elastic tissues, form an insoluble residue, amounting to about a third of the meat used.

Mercurial Peptones. E. Delpech. (*Journ. de Pharm.* [5], v., 151.)

1. *Normal Solution of Ammoniacal Mercuric Peptone*, for the preparation of solutions for hypodermic injection.

Peptone, in powder	9 grams.
Chloride of Ammonium, pure . .	9 „
Corrosive Sublimate	6 „

Dissolve in distilled water, 25 grams; filter, add pure glycerine 72 grams.

5 grams of this normal solution will contain exactly 0·25 gram of sublimate combined with peptone. Diluted in 25 grams of distilled water it gives a solution containing in each 1·20 gram (the usual measure of a syringe used for hypodermic injection) 10 milligrams

of sublimate combined with peptone. This normal solution is liable to precipitate after a time; it is, therefore, advisable to prepare only a small quantity. The author states, however, that this first precipitation does not injure the quality of the solution, as it consists of peptone in excess, and contains none of the mercurial compound, which remains stable and in solution. The precipitate or turbidity can be removed by filtration or careful decantation.

A gram of the ammoniacal mercuric peptone, according to the above formula, represents 0·25 gram of sublimate combined with peptone. A *solution for hypodermic injection* can, therefore, be prepared direct, as follows:—

Ammoniacal Mercuric Peptone . .	0·50 gram.
Distilled Water	25 grams.
Pure Glycerine	5 ,,

Dissolve and filter. Each syringeful (1·20 gram) will contain 5 milligrams of sublimate combined with peptone.

2. *Solution of Ammoniacal Mercuric Peptone with Glycerine*, for internal use.

Ammoniacal Mercuric Peptone . .	1 gram.
Price's Glycerine	50 grams.
Distilled Water	200 ,,

Dissolve and filter.

This solution is intended to replace Van Swieten's liquid, which is often badly tolerated by the stomach. A teaspoonful, representing 5 milligrams of sublimate combined with peptone, is given in a little water or milk.

Dr. Martineau is said to administer the ammoniacal mercuric peptone hypodermically; in cases of syphilis, 2 to 10 milligrams of sublimate in combination being injected daily in one operation. In some cases, it is reported, as many as forty-five injections have been made without producing local irritation, intestinal disturbances, or salivation; whilst the results have been satisfactory, showing that although the combination of corrosive sublimate with peptone diminishes the irritant action of the mercuric salt, it does not affect its curative properties.

New Formulæ. C. T. George. (From the author's report on "Unofficial and Local Formulæ," read before the last meeting of the Pennsylvania Pharmaceutical Association.)

Oleic Acid.—Dissolve dry white Castile soap, 10 lbs., in 4 gals. of hot water, add with constant stirring, sulphuric acid 30 oz.; decant the upper layer, wash it with warm water, and dissolve in it, at a

moderate heat, 10 ounces of finely powdered litharge; while still warm, pour the whole into 12 pints of deodorized benzin, and after twenty-four hours pour off from the deposit of lead palmitate. Shake the clear filtrate well with 4 oz. of pure hydrochloric acid diluted with 4 pints of cold water, decant and filter the benzin solution of oleic acid, evaporate in an open dish, heat over a water-bath until all the odour of benzin has disappeared, wash with warm water, and filter. The yield will be about 5 lbs.

Linimentum Saponis.—Dissolve camphor ℥ii., in alcohol Oii.; add oleic acid ℥ii. and oil of rosemary f ℥ss.; then gradually add sodium bicarbonate ʒv., and when effervescence has ceased, add water f ℥vi., and filter. It will not deposit in cold weather.

Elixir of Phosphorus.—Phosphorus gr x., bromide of ethyl f ʒx.; dissolve and add stronger alcohol f℥viii. and elixir of orange sufficient to make 1 gallon. Each drachm contains $\frac{1}{700}$ grain of phosphorus.

Elixir of Phosphorus, Quinia, and Strychnia.—Dissolve strychnia $2\frac{1}{3}$ gr. and sulphate of quinia 64 gr., with dilute sulphuric acid q.s., in elixir of phosphorus 1 pint.

Syrupus Aurantii Corticis Recentis.—Macerate, for eight days, 12 ounces of freshly grated orange-peel in alcohol 20 ounces and water 5 pints; filter and dissolve without heat 10 lbs. of white granular sugar.

Syr. Limonis Cortic. Rec. may be made in the same manner.

Emulsion of Cod-liver Oil.—Irish moss 1 oz., water 1 pint; boil for fifteen or twenty minutes, stirring constantly, and strain when cold. Gradually add, with constant stirring and beating, a mixture of cod-liver oil $2\frac{1}{2}$ pints, oil of bitter almonds 2 scruples, and oil of wintergreen 6 drachms; when perfectly emulsified, add 12 fluid ounces of glycerin and sufficient water to make the whole measure 5 pints. Salts soluble in water may be added, or other essential oils may be used.

Emulsion of Castor Oil.—Castor oil 1 pint, oil of wintergreen 2 drachms, glyconin 4 fluid ounces, glycerin $6\frac{1}{2}$ fluid ounces, cinnamon water sufficient for 2 pints. Add the oils gradually to the glyconin, stirring constantly; when perfectly emulsified, add the glycerin and water.

Cologne Water.—Oil of neroli ℥i., oil of bergamot ℥iv., oil of rose ʒi., oil of coriander ʒii., oil of santal ʒii., extracts of vanilla, jasmin, and musk, of each ℥viii., extract of orris ʒxvi., benzoic acid (from the resin) ʒiv., deodorized alcohol Oxii., distilled water Oiii. Mix.

Orange Cologne.—Oil of neroli ʒii., oil of bergamot ʒiv., extract

of jasmin ℥i., extracts of orange, musk and rose, each ℥iv., deodorized alcohol Oiiiss, orange-flower water Oss. Mix.

The extracts of *jasmin*, *orange*, and *rose*, are made by washing the pomade with deodorized alcohol. Extract of *vanilla* is made of vanilla 1 oz., sugar 2 oz., deodorized alcohol 1 pint. Extract of *musk* consists of musk 1 drachm, potassa solution 2 drachms, and deodorized alcohol 1 pint. Extract of *orris* is made from orris root 4 lbs., and sufficient deodorized alcohol to obtain 4 pints of tincture; add 4 drachms pure sulphuric acid, shake occasionally, and after two days add 2 ounces of barium carbonate, agitate and filter.

Formula for Quinetum (the mixed Alkaloids of Red Bark). (*New Remedies*, Jan., 1882, from the non-official Formulary of the Dutch Society for the Advancement of Pharmacy.)

Red Cinchona Bark (the bark of the trunk of *Cinchona succirubra*, grown in Java or India), in fine powder	1000
Normal Hydrochloric Acid (volumetric standard)	1000
Oxalic Acid	12
Solution of Soda	q.s.
Water	q.s.

Macerate the cinchona with the hydrochloric acid and 3000 parts of water for at least twelve hours, occasionally stirring. Pour the mixture into a percolator, the lower orifice of which is closed by a linen plug, and, as soon as the liquid runs off clear, displace with water until the liquid running from the percolator is no longer precipitated (though it may be coloured) by solution of soda.

To the strained liquid (which may amount to perhaps 8000 parts) add the oxalic acid dissolved in a little water, and then add *carefully*, under continued stirring, just enough solution of soda, until the precipitate which forms at first, separates in coherent flakes. Separate this precipitate (which consists of oxalate of calcium and cinchona red) by pouring off as much of the still acid, clear liquid as is possible, and filter the remainder. To the united liquids add now an excess of solution of soda, let it settle, and collect the precipitate upon a moistened double filter.

Wash it with a weak soda solution until the washings have only a light red colour, then wash with the least possible quantity of water, until the washings begin to have a bitter taste. Let the precipitate drain, dry it in the air, and powder it.

Quinetum is completely soluble in strong warm alcohol. When 3·1 grams of quinetum are dissolved in 10 c.c. of normal hydrochloric acid, this solution must be clear, and, on the addition of

2 grams of Rochelle salt, must yield a precipitate which, when dried, should amount to *at least* 65 per cent. of the weight of the quinetum dissolved.

Purified Quinoidine. (*New Remedies*, Jan., 1882, from the non-official Formulary of the Dutch Society for the Advancement of Pharmacy.) This can be prepared by the following process :—

Commercial Quinoidine	1 part.
Benzol	3 parts.

Digest the quinoidine, while agitating or stirring with 2 parts of the benzol, on the water-bath. Pour off the clear solution, and wash the residue with the remainder of the benzol. Shake the united clear liquids with a small excess of dilute hydrochloric acid, remove the acid liquid, after settling, by a separating funnel, and render it faintly alkaline by solution of soda. Examine a small sample for its purity, by adding to the clear, diluted solution a few drops of concentrated solution of hyposulphite of sodium, whereby a precipitate must not be produced which does not disappear on further dilution with water. If this is the case, then the whole liquid must be purified by adding the hyposulphite until no longer a permanent precipitate is produced. Then warm the liquid on the water-bath, mix it with an excess of soda, wash the precipitate with water, and dry it on the water-bath.

Quinoidine thus purified appears, in thin layers, as a dark yellowish brown, transparent mass, completely soluble in benzol, alcohol, and acids. Ether should dissolve at least 70 per cent. of it. The saturated compounds with acids have an alkaline reaction, and must be soluble in water, in all proportions. Salts of impure quinoidine yield clear solutions only with *a little* water; on the addition of more water they are rendered turbid.

Cod-liver Oil Jelly. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, Sept. 1881.) Cod-liver oil jelly can easily be prepared in the following manner :—

Cod-liver Oil.	5 fluid ounces.
Best Isinglass	2 drachms.
Sugar (white), powdered . . .	1¼ ounce.
Oil of Bitter Almonds	4 drops.
,, Allspice	4 ,,
,, Cinnamon (Ceylon) . . .	2 ,,
Water	1 fluid ounce.

Having placed the cod-liver oil, isinglass, and water in a suitable vessel over a water-bath, apply sufficient heat to melt the isinglass,

then add the sugar, the essential oils having been mixed with it by trituration, and remove from the fire, stirring the mixture as it cools until it thickens. When it is cold, a firm jelly will result, which will keep without spoiling for any length of time if put up in corked bottles. The consistence of this jelly is such that it may be taken in water, milk, or wine without tasting the oil.

A Pliable Medium for the Application of Iodoform. Dr. Fowler. (*New York Medical Record*, July 9, 1881.) The formula recommended is as follows:—

Iodoform	1 ounce.
Isinglass.	8 ounces.
Glycerine	½ ounce.

The isinglass is reduced to a jelly by steam, and the glycerine mixed with it, and finally the iodoform.

Gelatin-Bromide Emulsion. (*Journ. Chem. Soc.*, from *Photographic News*, 1882, 257.) This is a short account of a patent taken out by M. Plener, for separating the sensitive silver bromide compound from the emulsion, and, after washing it, again mixing it with fresh gelatin. This is done by placing the melted emulsion in a metallic vessel of the shape of a truncated cone, silver-plated inside, which is then made to rotate at a very high speed (4000 revolutions per minute for a vessel one foot in diameter) for about ten minutes, keeping the gelatin emulsion from setting by heating the vessel externally. In this way the solid sensitive silver compound is deposited on the circumference of the bottom of the vessel, and the clear gelatin solution may be syphoned out. The silver compound is then mixed with warm water by means of a brush, again separated by rotating the vessel, and the operation repeated until all traces of gelatin and soluble salts have been removed. The purified sensitive silver compound can then be mixed with fresh gelatin, collodion, etc., for preparing sensitive plates.

The important feature in the process is that it allows of fresh undecomposed gelatin being substituted for that which has been decomposed by heat, etc., in the preparation of the original emulsion, and thus greatly diminishes or entirely removes the tendency to green fog and frilling. Moreover, the original emulsion may be diluted to any extent, or any desired proportion of gelatin may be employed, so that the sensitive silver compound may be obtained in the most advantageous state of division, and can subsequently be incorporated with the proper proportion of fresh undecomposed gelatin.

Compressed Granules for Hypodermic Use. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, 1881, 396.) Of the various forms in which powerful medicines are dispensed for hypodermic use, perhaps none are so convenient as the small compressed granules or tablets, that are now being introduced to the notice of physicians. As the uses for which these are intended have of late increased, and as this method of administering medicine has grown in favour both with the physician and patient, a mention of the care that ought to be taken in their preparation may not be out of place. The advantages of convenience, accuracy, and of being presented in a form not liable to undergo change, will doubtless bring them into general use.

The pellets are small discs, weighing from half a grain to a grain, and are of the same shape as compressed pills, and made in the same manner. In making them great caution and precision are necessary, not only in thoroughly mixing the ingredients, but in using such as are prepared especially for the purpose, the reasons for which will be presently explained. The medicinal ingredients they contain, such as morphine hydrochlorate or sulphate, or the atropine salts, etc., are mixed carefully with sodium chloride or sulphate, in order to render the alkaloids more readily soluble by separation of their particles, which, by the compression necessary would otherwise be in a condition that would require more time to effect solution than would be convenient. The sodium sulphate has the advantage of being an efflorescent salt, so that however long kept the granules will not absorb moisture, and the medicinal ingredients, therefore, will remain unchanged.

Both the sulphates of sodium and of morphine, as found in the market, contain mechanical impurities that should be carefully removed before using, as particles of dust, fibre, etc., if injected might give rise to much inconvenience, and, in some cases, produce abscess. The salts are dissolved in distilled water, the solutions filtered, and the filtrate evaporated until crystallization begins, and afterwards occasionally stirred and evaporated to dryness. During this operation all dust should be carefully excluded. Working on a large scale, the evaporation may be conducted in a hot-air chamber, to which air is admitted by passing it through cotton felt.

The employment of crystallizable substances, such as sulphate or chloride of sodium, as a diffusing agent is certainly preferable to gelatin, which has also been employed, the objection to which is, that being a nitrogenized body it is prone to undergo decomposition when exposed to heat and moisture.

Elatina. M. Ciutlini. (*Pharmaceut. Zeitung.*) This name is applied to a substitute for tar-water, which is used in Italy for coughs and intestinal catarrh. The author gives the following formula :—

Green Pine Cones	600 parts.
Olibanum	8 ,,
Balsam of Tolu	5 ,,
Resin	4 ,,
Juniper Berries	60 ,,

The ingredients are covered with a sufficient quantity of water, allowed to stand over night, and next morning 1,200 parts of liquid are distilled off over a moderate fire. The distillate is filtered and bottled. The dose is stated to be half a wineglassful two or three times a day.

Non-Explosive Coloured Fires. M. Sailer. (*Schweiz. Wochenschr. für Pharm.*) Owing to the danger which always more or less attends the preparation and storing of the ordinary mixtures for coloured fires containing potassium chlorate and sulphur, the author suggests the following formulæ as involving no risk whatever :—

Red.

Shellac	1 part.
Nitrate of Strontium	5 parts.

Yellow.

Nitrate of Sodium, pure and dry . . .	1 part.
Shellac	4 parts.

Green.

Shellac	1 part.
Nitrate of Barium	5 parts.

The shellac is fused with the colour-producing salt, which must be *chemically pure*, and the resulting mass preserved in tight tin boxes.

Phosphorescent Powders. (*Journ. de Pharm. et de Chim.*, 1881, 352.) These powders, which have been employed for rendering signs, dials, etc., visible at night, are prepared by mixing 100 grams of calcium carbonate and phosphate, prepared by calcining oyster shells or cuttlefish bones, with 100 grams of caustic lime, 25 grams of calcined table salt, and adding to this mixture from 20 to 25 per cent. of sulphur and 3 to 7 per cent. of sulphide of calcium, barium, strontium, or magnesium, previously exposed to sunlight. A phosphorescent material prepared by incinerating marine algæ

is also added for the purpose of increasing the illuminating power. The powders are rendered adhesive by means of varnish, collodion, paraffin, isinglass, etc., or may be incorporated in melted glass.

Cigar Flavours. (From the *Canadian Pharm. Journ.*, 1881.)

I.

Fluid Extract of Valerian	fl. oz.	1
Tincture of Tonka-bean (1—8)	,,	8
Alcohol, enough to make	,,	32

II.

Valerianic Acid	fl. dr.	3
Butyric Ether	mm.	10
Acetic Ether	,,	40
Alcohol	fl. oz.	64

III.

Tincture of Valerian	fl. dr.	4
Butyric Ether	,,	4
Tincture of Vanilla	,,	2
Spirit of Nitrous Ether	,,	1
Alcohol	fl. oz.	5
Water, enough to make	,,	16

Formula for Acetum Aromaticum. (*New Remedies*, Jan., 1882, from the non-official Formulary of the Dutch Society for the Advancement of Pharmacy.)

Oil of Rosemary	1 part.
,, Juniper	1 ,,
,, Lemon	1 ,,
,, Thyme	2 parts.
,, Cloves	5 ,,
Tincture of Cinnamon	100 ,,
Aromatic Tincture	50 ,,
Dilute Acetic Acid	1000 ,,
Distilled Water	200 ,,

Mix and filter.

Æther Cantharidatus (Blistering Ether). (*New Remedies*, Jan., 1882, from the non-official Formulary of the Dutch Society for the Advancement of Pharmacy.)

Cantharides	2 parts.
Ether	q. s.

Pack the cantharides in a percolator, pour ether on the top, until they are penetrated, and set aside, well covered for twenty-four hours. Then gradually pour ether on the top until three parts of product are obtained.

Scented Soaps. (*Chem. and Drugg.*, 1881, 361. From the "Seifenfabrikant.")

Brown Eagle Soap.

Cochin Cocoa-nut Oil	70 kilos.
Hogs' Lard	30 ,,
Soda Lye, 38° B.	50 ,,

The soap is perfumed with—

Mirbane Oil	160 grains.
Bergamot Oil	120 ,,
Clove Oil	70 ,,

And coloured with 140 grains "Brillantbraun," previously dissolved in boiling water.

Family Soap.

Cocoa-nut Oil	25 kilos.
Soda Lye, 30° B.	20 ,,

Perfumed with—

Bergamot Oil.	40 grains.
Cassia Oil	40 ,,
Sassafras Oil	20 ,,
Lemon Oil	20 ,,

Violet Soap.

Cochin Cocoa-nut Oil	50 kilos.
Soda Lye, 38° B.	24 ,,
Potash Lye, 38° B.	1 ,,

Perfumed with 1 kilog. violet root and ½ kilo. storax liquid, infused in fats.

Cassia Oil	25 grains.
Sassafras Oil	25 ,,
Bergamot Oil.	25 ,,
Lavender Oil.	30 ,,
Peruvian Balsam	20 ,,
Orange-peel Oil	10 ,,
Palma-rosa Oil	6 ,,
Musk Essence	35 ,,

And coloured with 70 grains "Brillantbraun" dissolved in boiling water.

Tar Soap.

Cocoa-nut Oil	35 kilos.
Soda Lye, 40°, B.	18 ,,
Good Wood Tar	3 ,,

Infused in the melted Cocoa-nut Oil.

Medicated Soaps. (*Pharmaceutische Centralhalle*, December 15th, 1881.)

Tannin Soap.—9 kilos. of cocoa-nut oil are saponified with 4·5 kilos. of soda lye; 250 grams of tannin dissolved in alcohol are then added, and finally the perfume, consisting of Peru balsam, 30 grams, oil of cassia and oil of cloves, of each 10 grams.

Iodine Soap.—10 kilos. of cocoa-nut oil, 5 kilos. of lye of 38° B., and 500 grams of potassium iodide dissolved in 250 grams of water.

Gall Soap.—1·5 kilos. of galls are mixed with 25 kilos. of cocoa-nut oil, and the latter saponified in the cold with 12·5 kilos. of soda lye of 38° B. The soap is coloured with 350 grams of ultramarine green, and perfumed with 75 grams each of oil of lavender and caraway.

Camphorated Sulphur Soap.—12 kilos. of cocoa-nut oil, 6 kilos. of soda lye of 38° B., 1 kilo. of sulphuretted potash dissolved in 0·5 kilo. of water, 160 grams of camphor, to be dissolved in the melted cocoa-nut oil.

Cosmetic. The following formula is recommended in the *Pharmaceut. Zeitung* (1881, No. 68) :—

White Wax	50 grams.
Beef Tallow	100 ,,
Oil of Bergamot	6 ,,
,, Cassia	16 gtt.
,, Thyme	8 ,,

A yellow colour is produced by tincture of saffron or tincture of turmeric, a brown colour by burnt umber in oil, and a black colour by animal charcoal ground in oil.

Tooth Wash. (*New Remedies*, 1882, 145.)

White Oak Bark, in fine powder . .	2½ ounces.
Rhatany, ,, ,, . .	½ ounce.
Sassafras, ,, ,, . .	1 dram.
Red Cinchona, ,, ,, . .	3 drams.
Cardamom, ,, ,, . .	30 grains.
Cinnamon, Ceylon, ,, ,, . .	20 ,,
Cloves, ,, ,, . .	30 ,,
Oil of Wintergreen	1 fl. dram.
Oil of Anise	½ ,, ,,
Alcohol	20 fl. ounces.
Water.	12 ,, ,,

Macerate ten days, and filter. Finished product, 1¾ pint.

Punch Essence. A correspondent of the *Pharm. Zeitung* suggests the following for making a superior essence:—

White Sugar	22 pounds.
Lemons	12 „
Oranges	12 „
Green Tea	2½ ounces.
Cinnamon	½ ounce.
Vanilla	½ „
Tartaric Acid	1 „
Rum	1 gallon.
Arrac	1 „
Water, boiling	1 pint.
Red Wine	sufficient.

Peel the lemons and oranges, and digest the peels with the rum for three days. Express the peeled fruits, and dissolve the tartaric acid in the juice. Digest the tea, cinnamon, and vanilla for fifteen minutes with the boiling water. Filter all the solutions, and add them to a thick syrup prepared by boiling the sugar with a sufficient quantity of red wine.

Soluble Cocoa. (*Pharmaceut. Centralhalle*, 1881, 509.) Soluble cocoa, or Dutch cocoa, was first prepared in Holland, by depriving the seed of fat by pressure, and digesting the press cake with sodium or potassium carbonate, which treatment renders cellulose, starch, and albuminoids more readily soluble in water. O. Rueger prepares also soluble cocoa mass which contains all the oil; the latter is first removed by pressure, the residue is treated as stated above, and the fat is afterwards added again. Thus prepared it contains a somewhat larger percentage of ash, but yields a palatable beverage simply by stirring with hot water, without boiling. This mass was found to contain cocoa-butter, 47·73; nitrogenated compounds, 12·3; ash, 5·4; and in the latter alkaline carbonates, 2·25 per cent. Cocoa powder, similarly prepared, contained fat, 30·45; nitrogenated compounds, 19·94; ash, 6·1; with alkaline carbonates, 2·78 per cent.

Cements. (*New Remedies*, January, 1882.) Excellent cements may be prepared from some of the constituents of milk, particularly casein. The following are good formulæ for preparing some of them:—

Parabolic Cement.—This is a variety of casein or cheese cement, prepared as follows:—Curdle skim-milk with rennet or vinegar, press out the whey, and dry the curd by a very gentle heat, but as quickly as possible. When quite dry, grind it in a pepper or coffee

mill, and triturate it in a mortar until reduced to a very fine powder. Mix 10 parts, by weight, of this powder with 1 part of quick-lime, also in very fine powder, and to every ounce of the mixture add five or six grains of camphor. Triturate the whole well together, and keep in vials well corked. Used to unite glass, earthenware, etc., which it does very strongly. It is made into a paste, with a little water, as wanted, and applied immediately.

Milk Cement.—This cement is not so generally known as it ought to be. It is the simplest and best domestic cement for repairing china and crockery. The process consists simply in tying the parts firmly together and boiling them in skim-milk. The tying together of the pieces of a round cup or bowl is not a very simple matter, but it can be done by going the right way to work. First, arrange the parts in their proper positions, and, if a bowl, set it mouth down, as the pieces will keep their arrangement best in this position. Then wind stout tape round the article, so as to hold the pieces together. Tape is far better than twine, and some pieces should be kept for that purpose. It is easy to draw the tape tight until near the ends, and then special devices must be used. When sufficient tape has been wound round the article, let one person hold it from slipping, by pressing a finger firmly on each end, and then let another person tie the ends in a firm knot, but leaving the tape so loose from the article that a pencil or stout skewer may be passed under it. Then by twisting the skewer, the tape is tightened in the same way that a surgeon compresses an artery with his tourniquet, and by passing the fingers over the tape, and smoothing it forward towards the ends, all the pieces may be pressed together with a firmness that cannot be obtained in any other way. The article should now be placed in a pan of cold milk (skim-milk is the best and cheapest), which should be gradually heated to the boiling point, and kept at this temperature for some time—say half an hour to an hour,—care being taken not to allow it to burn. The articles are allowed to cool in the milk, and when taken out are wiped dry and allowed to stand for a day or two until the cement has become quite hard. They may then be washed with warm water, and the parts will be found to be strongly cemented together. The same milk may be used again, but not with such good effect. Generally, however, it is possible to pack quite a number of articles in the pan in the first place, especially if they can be *nested*, or placed one within the other.

Cement for Mending Pestles, etc. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, 1881, 396.) One of the strongest cements is ob-

tained when equal quantities of gutta-percha and shellac are melted together and well stirred. This is best done in an iron capsule placed on a sand-bath, and heated either over a gas furnace or on the top of a stove. It is a combination possessing both hardness and toughness, qualities that make it particularly desirable in mending pestles and mortars. It is very useful for securing the handles to wedgwood ware. Of course when this cement is used the articles to be mended should be warmed to about the melting-point of the mixture, and then retained in proper position until cool, when they will be ready for use.

Liquid Starch Gloss. (*Pharm. Journ.*, 3rd series, xii., 318.)

Spermaceti	2 ounces.
Gum Senegal	2 ,,
Borax	2 ,,
Glycerin	5 ,,
Water	49 ,,

Mix and boil together. Two or three teaspoonfuls to be added to a quarter of a pound of boiled starch.

Coating for Blackboards. (*Pharmaceut. Zeitung*, 1881, No. 72.) H. Schoeneweg recommends the following:—

Sandarac	300 grams.
Shellac	300 ,,
Lampblack	200 ,,
Ultramarine	30 ,,
Ether	10 ,,
Alcohol, 96 per cent.	4 litres.

The following formula is recommended by C. Welcker:—

Shellac	200 grams.
Camphor	80 ,,
Lampblack.	90 ,,
Ether.	800 ,,
Alcohol	1000 ,,

Durable Labels for Stock-Bottles. R. Triest. (*New Remedies*, January, 1882.) Ordinary glazed paper, preferably of a citron-yellow colour, is wiped over with a damp sponge, and then again allowed to dry.

The ink used for writing the labels is prepared from 3 parts of extract of logwood, and 1 part of bichromate of potassium, dissolved in 30 parts of water. After standing until it has become clear, the liquid is decanted from the sediment, and 2 parts of gum arabic are then added.

When the writing has become dry, the label is affixed to the receptacle by means of a glue-paste, prepared by pouring a boiling solution of carpenter's glue into a cold prepared paste, made from wheat-flour and water.

When the label has become dry, it is brushed over twice with the same glue-paste, the second application being delayed until the first is dry.

Finally, the label is varnished over with damar varnish, containing 10 per cent. of Canada balsam.

Cheap Logwood Ink. J. Schmieden. (*Pharmaceut. Zeitung*, 1882, 78.) Dissolve 750 grams of logwood extract in 14 litres of boiling water; add 750 grams of alum, and when dissolved 200 grams of sulphuric acid, and, with continuous agitation, 80 grams of yellow potassium chromate, previously dissolved in 500 grams of lukewarm water; finally, add a solution of 100 grams of ferrous sulphate in 300 grams of crude hydrochloric acid, dissolve in the ink 100 grams of gum arabic, and dilute to 20 litres. The ink writes with a reddish colour, but on drying is a deep black.

Permanent Solution of Litmus. (*Amer. Journ. Pharm.*, 1882, 220.) Various formulæ have from time to time been proposed in the journals for obtaining a permanent litmus solution, which appear, however, more or less circumstantial. The following method yields a solution which may be preserved for months in a vessel closed with paper, or even with a cork. The litmus solution is first prepared, according to the suggestion of Mohr, "*Lehrbuch der chem.-analyt. Titrirmethode*," p. 73, and subsequently evaporated, at a temperature of 90° C., to dryness; if the residue is then dissolved in a little glycerin, a solution is obtained which remains permanent for months, and its sensitiveness is in nowise influenced. For its application it is only necessary to dip a glass rod into the solution, which amount suffices for tinting any required amount of liquid.

Crystallization: Table of various Chemicals. E. Finot and A. Bertrand. (*Journ. de Pharm. et de chim.*, 1881, 259.) It is often desirable to know at which point the evaporation of a solution is to be interrupted in order to procure a good crop of crystals on cooling. The densities given in the following table refer to the warm solutions, and are expressed in degrees Baumé:—

Aluminum Sulphate	25
Alum (Amm. or Pot.)	20
Ammonium Acetate	14
" Arsenate	50

Ammonium Benzoate	5
,, Bichromate	28
,, Bromide	30
,, Chloride	12
,, Nitrate	29
,, Oxalate	5
,, Phosphate	35
,, Sulphate	28
,, Sulphocyanide	18
,, Tartrate	25
Barium Ethylsulphate	43
,, Formate	32
,, Hyposulphite	24
,, Nitrate	18
,, Oxide	12
Bismuth Nitrate	70
Boric Acid	6
Cadmium Bromide	65
Calcium Chloride	40
,, Ethylsulphate	36
,, Lactate	8
,, Nitrate	55
Cobalt Chloride	41
,, Nitrate	50
,, Sulphate	40
Copper Acetate	5
,, Ammon. Sulph.	35
,, Chloride	45
,, Nitrate	55
,, Sulphate	30
Iron, Ammon. Oxalate	30
,, Ammon. Sulphate	31
,, Sulphate	31
,, Tartrate	40
Lead Acetate	42
,, Nitrate	50
Magnesium Chloride	35
,, Lactate	6
,, Nitrate	45
,, Sulphate	40
Manganese Chloride	47
,, Lactate	8
,, Sulphate	44
Mercury, Cyanide	20
Nickel, Acetate	30
,, Ammon.	18
,, Chloride	50
,, Sulphate	40
Oxalic Acid	12
Potass. and Sod. Tartrate	36

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Proceedings of the Connecticut Pharmaceutical Association at the Fifth Annual Meeting. Also the Constitution, By-Laws, and Roll of Members. 1881. Pp. 97, 8vo.

Proceedings of the Ohio State Pharmaceutical Association. Third Annual Meeting. 1881. Pp. 75, 8vo.

Proceedings of the Wisconsin Pharmaceutical Association. Second Annual Meeting. 1881. Pp. 51, 8vo.

Proceedings of the Pennsylvania Pharmaceutical Association at its Fourth Annual Meeting, with the Constitution, By-Laws, Code of Ethics, and Roll of Members. 1881. Pp. 160, 8vo.

Advanced Sheets of First Biennial Report of the Commissioners of Pharmacy for the State of Iowa. 1881. Pp. 36, 8vo.

Proceedings of the North Carolina Pharmaceutical Association at its Second Annual Meeting, held at Newbern, Aug. 9th and 10th, 1881. Also Constitution and By-laws.

TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

NINETEENTH ANNUAL MEETING

AT

SOUTHAMPTON,

1882.

CONTENTS.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*** *Authors are specially requested to send the titles of their Papers to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

(Name)..

(Address) ....

as a Member of the British Pharmaceutical Conference.

....*Member.*

Date..

This or any similar form must be filled up legibly, and forwarded to *The Secretary, Brit. Pharm. Conf.*, 17, Bloomsbury Square, London, W.C. who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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Webb, Mr. E. A., Cookham Dene, Manor Park, Chislehurst, S.E.
Webber, Mr. C. F., Market Place, Sidmouth, Devon.
Webster, Mr. E. P., Dispensary Lane, Newcastle-on-Tyne.
Wellcome, Mr. H. S., 7, Snow Hill, Holborn Viaduct, E.C.
Wells, Mr. T., The Grange, St. Mark's Road, Notting Hill, W.
Wells, Mr. W. F., junr., 52, Upper Sackville Street, Dublin.
West, Mr. E. R., 17, Strand, Dawlish.
West, Mr. T., 61, Chester Road, Stretford, Manchester.
West, Mr. W., 15, Horton Lane, Bradford.
Westlake, Mr. J., 4, High Street, Sutton.
Weston, Mr. C., 2, High Street, Ventnor, Isle of Wight.
Weston, Mr. S. J., 151, Westbourne Terrace, W.
Westrup, Mr. J. B., 76, Kensington Park Road, W.
Wheeldon, Mr. J., 241, Stockport Road, Manchester.
Wheeler, Mr. J. W., 1, Jermyn Street, St. James's, S.W.
While, Mr. W. J., 123, London Street, Reading.
Whincup, Mr. W., 404, Essex Road, Islington, N.
White, Mr. E. A., Mayfield, Sussex.
White, Mr. F., London Road, Nottingham.
White, Mr. J. D., 7, Guildhall Square, Carmarthen.
White, Mr. J. W., 52, Royal York Crescent, Clifton, Bristol.
White, Mr. W., 15, Westgate, Bradford, Yorks.
Whitfield, J., F.C.S., 113, Westborough, Scarborough.
Whitford, Mr. J. G. P., 20, Mardyke Parade, Cork.
Whiting, Mr. I., 30, Elizabeth Street, Cheetham, Manchester.
Whitla, Mr. M. R., Medical Hall, Monaghan.
Whitrow, Mr. B., 3, Culverden Colonnade, Tunbridge Wells.
Whittaker, Mr. E., 32, Regent Road, Salford, Lancs.
Whittle, Mr. S., Leigh, Lancashire.
Whittles, Mr. H., 44, Wheeler Street, Lozells, Birmingham.
Whysall, Mr. W., Grantham.

Whyte, Mr. W., 377, Sauciehall Street, Glasgow.
Wiggins, Mr. H., 236, Southwark Park Road, Bermondsey, S.E.
Wild, Mr. F., 285, Oxford Street, Manchester.
Wild, Mr. J., Clarendon Place, Hyde, Cheshire.
Wilford, Mr. J., 7, Lower Parliament Street, Nottingham.
Wilkinson, Mr. B. J., 1, Middleton Road, Kingsland, E.
Wilkinson, Mr. G., 267, Waterloo Road, Manchester.
Wilkinson, Mr. T., 270, Regent Street, W.
Wilkinson, Mr. W., 51, Lambeth Walk, S.E.
Wilkinson, Mr. W., 263, Cheetham Hill, Manchester.
Wilkinson-Newsholme, Mr. G. T., 74, Market Place, Sheffield.
Wilks, Mr. M., 70, Market Place, Burnley, Lancs.
Will, Mr. W. W., 30, Lower Hall Street, Montrose, N.B.
Willan, Mr. R., 5, Market Street, Ulverston.
Willan, Mr. W., 3, Friargate, Preston, Lancs.
Williams, Mr. C. J., 4, St. John's, Warwick.
Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
Williams, Mr. E., 10, Wrexham Street, Mold.
Williams, J., F.I.C., F.C.S., 16, Cross Street, Hatton Garden, E.C.
Williams, Mr. J., Victoria Road, Aldershot.
Williams, Mr. J. D., Turret House, Bodmin, Cornwall.
Williams, Mr. J. T., Nelson Street, Swansea.
Williams, Mr. J. V., 95, Old Town Street, Plymouth.
Williams, Mr. J. W., 6, Giltspur Street, E.C.
Williams, M. W., F.I.C., F.C.S., Address unknown.
Williams, Mr. R., St. Clears, Carmarthenshire.
Williams, Mr. T., 11, Bute Street, Cardiff.
Williams, Mr. T. H., 125, Fortess Road, N.W.
Williams, Mr. W., 265, Crown Street, Liverpool.
Williams, Mr. W., Llanfyllin.
Williams, Mr. W. D., High Street, Hampstead, N.W.
Williams, Mr. W. H., Hayle, Cornwall.
Williams, Mr. W. J., 137, Cannon Street, E.C.
Willis, Mr. C., 55, High Street, King's Lynn.
Willmott, Mr. W., King's College Hospital, W.C.
Willmott, Mr. W., Wicker Brewery, Sheffield.
Wills, Mr. G. S. V., Gladstone House, St. George's Rd., Southwark, S.E.
Willsher, Mr. S. H., High Street, Tenterden.
Wilson, Mr. C. F., 23, Liverpool Road, Stoke-on-Trent.
Wilson, Mr. G., 40, Cathcart Street, Greenock, N.B.
Wilson, Mr. J., General Infirmary, Derby.
Wilson, Mr. J., Penrith, Cumberland.
Wilson, Mr. J., 34, Charlotte Street, Leith, N.B.
Wilson, Mr. J. H., 5, West Park, Harrogate.
Wilson, Mr. J. M., 16, Leven Street, Edinburgh.
Wilson, Mr. T., Stowmarket.
Wilson, Mr. T. W., Bootham, York.
Wing, Mr. G. N., Melton Mowbray.
Wing, Mr. Lewis, Chislehurst, W., Kent.
Wink, Mr. J. A., 5, Barge Yard, Bucklersbury, E.C.
Wood, Mr. A., New Brentford.
Wood, Mr. A., 6, London Road, Sheffield.
Wood, C. H., F.I.C., F.C.S., Mildmay Chambers, 82, Bishopsgate St., E.C.
Wood, Mr. F., 18, Clarence Street, Cheltenham.
Wood, Mr. R., 25, Mill Street, Macclesfield.
Wood, Mr. W. A., Chadwick Street, Hunslet, Leeds.
Woodcock, R. C., F.I.C., F.C.S., 14, Ferndale Road, Clapham, S.W.
Woodland, J., F.L.S., F.C.S., Grosvenor Villa, Devonport Road, Uxbridge Road, W.
Woodland, Mr. W. F., Fore Street, Chard, Somersetshire.

Woodward, Mr. J. L., Bridgewater.
Woolcott, Mr. C., 49, Upper Parade, Leamington.
Woolley, Mr. G. S., 69, Market Street, Manchester.
Woolley, Mr. Harold, 69, Market Street, Manchester.
Woolley, Mr. Hermann, Knowsley Street, Cheetham, Manchester.
Woolrich, Mr. C. B., Uttoxeter, Staffs.
Wootton, Mr. A. C., 44a, Cannon Street, E.C.
Wootton, Mr. P., Market Place, Luton, Beds.
Worrall, Mr. T. W., 11, Theatre Street, Preston.
Worth, Mr. E., Town Hall, Bournemouth.
Wright, A., A.K.C., 8, Bentinck Crescent, Elswick Road, Newcastle-on-Tyne.
Wright, C. R. A., D.Sc., F.R.S., F.I.C., F.C.S., St. Mary's Hospital, W.
Wright, Mr. G., 102, High Street, Burton-on-Trent.
Wright, Mr. J., 46, Bridge Street, Leeds.
Wright, Mr. W. O., 55, Great Scotland Road, Liverpool.
Wyatt, Mr. H., 29, Derby Road, Bootle, Liverpool.
Wyborn, Mr. J. M., 59, Moorgate Street, E.C.
Wyles, Mr. W., I, New Bridge, Dover.
Wyley, Mr. W. F., Hertford Street, Coventry.
Wylie, Mr. D. N., 1, South College Street, Edinburgh.
Wyman, Mr. J., Charles Street, Farringdon Road, E.C.
Wynne, Mr. E. P., 3, Pier Street, Aberystwith.

Yates, Mr. D., 32, Darwen Street, Blackburn.
Yates, Mr. F., 64, Park Street, Southwark, S.E.
Yeomans, Mr. J., 22, Petty Cury, Cambridge.
Yewdall, Mr. E., 56, Wade Lane, Leeds.
Young, Mr. J., 16, Gallowtree Gate, Leicester.
Young, Mr. J., 20, High Street, Newport, Mon.
Young, Mr. J., Folds Road, Bolton.
Young, J. R., F.C.S., Sankey Street, Warrington.
Young, Mr. J. R., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows:—

THE SECRETARY,

BRIT. PHARM. CONF.,

17, *Bloomsbury Square,*

London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.
The North British Branch of the Pharmaceutical Society of Great Britain.
The Pharmaceutical Society of Ireland.

ABERDEEN.—Society of Chemists and Druggists (1839). Mr. A. Strachan, 48, Richmond Street, Aberdeen.
ARBROATH.—Chemists' Association (1874). Mr. James Jach, Bell Rock, Signal Tower, Arbroath.
ASHTON-UNDER-LYNE.—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). Mr. E. Fisher, 106, Stamford Street, Ashton-under-Lyne.
BIRMINGHAM.—Midland Counties Chemists' Association (1869). Mr. S. Dewson, 90, New Street, Birmingham. Chemists' Assistants' Association (1868), Birmingham.
BRADFORD.—Chemists' Association (1869). Mr. H. G. Rogerson, Bradford.
BRIGHTON.—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.
BRISTOL.—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.
COLCHESTER.—Association of Chemists and Druggists (1845). Mr. W. B. Cordley, Colchester.
COVENTRY.—Coventry and Warwickshire Pharmaceutical Association (1877).
DOVER.—Chemists' Association. Mr. J. Wilford.
DUNDEE.—Chemists and Druggists' Association (1868). J. Russell, Dundee.
EDINBURGH.—Chemists' Assistants' Association. Mr. J. R. Hill.
EXETER.—Exeter Pharmaceutical Society (1845). G. Pasmore, Exeter.
GLASGOW.—Chemists and Druggists' Association (1854). Mr. Walter Paris, 83, Stirling Road, Glasgow.
HALIFAX.—Halifax and District Chemists and Druggists' Association (1868). Mr. W. C. Hebden, 64, North Gate, Halifax.
HULL.—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.
LEEDS.—Chemists' Association (1862). Mr. J. Hellowell, 88, West Street, Leeds.
LEICESTER.—Chemists' Assistants and Apprentices' Association (1869). Mr. S. F. Burford, Leicester.
LINCOLN.—Chemists' Association. Mr. C. F. Gadd, 200, High Street, Lincoln.
LIVERPOOL.—Chemists' Association (1868). The Secretary, Royal Institution, Colquitt Street, Liverpool.
LONDON.—Chemists' Assistants' Association. Mr. C. F. Wyatt, 300, High Holborn, W.C.
MANCHESTER.—Chemists and Druggists' Association (1853). F. B. Benger, F.C.S., 7, Exchange Street, Manchester.
NORTHAMPTON.—Pharmaceutical Association (1871). Mr. F. A. Ashton, 6, Regent Square, Northampton.
NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). Mr. C. W. Warriner, 135, Union Road, Nottingham.
OLDHAM.—Chemists' Assistants and Apprentices' Association (1870). Mr. J. Naylor, Oldham.
PLYMOUTH.—Association of Chemists for Plymouth, Devonport, and Stonehouse (1868). Mr. G. Breeze, Catherine Street, Devonport.
PRESTON.—Pharmaceutical Students' Society. Mr. H. Denham, 8, Regent Street, Preston.
SCARBOROUGH.—Chemists' Association (1870). J. Whitfield, F.C.S., Scarborough.
SHEFFIELD.—Pharmaceutical and Chemical Society (1869). Mr. G. T. W. Newsholme, 74, Market Place, Sheffield.
SUNDERLAND.—Chemists' Association (1869). Mr. C. Rankin, Sunderland.
TAUNTON.—Chemists' Association (1870). Mr. H. Prince, Fore Street, Taunton.
WOLVERHAMPTON.—Chemists and Druggists' Association (1874). Mr. W. Y. Brevitt, Darlington Street, Wolverhampton.
YORK.—Chemists' Association (1865). Mr. Saml. Scruton, 13, Micklegate, York.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE FORWARDED TO THE FOLLOWING:—

The Honorary Members.

Libraries.

American Pharmaceutical Association; Chemical Society of London; Ecole de Pharmacie, Montpellier; Massachusetts College of Pharmacy; The Mason's College, Birmingham; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Pharmaceutical Society of Toronto; Royal Society of London; Société de Pharmacie, Paris; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Arbroath Chemists' Association; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Coventry and Warwickshire Pharmaceutical Association; Exeter Pharmaceutical Society; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester Chemists' Assistants and Apprentices' Association; Liverpool Chemists' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; Northampton Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; Wolverhampton Chemists and Druggists' Association; York Chemists' Association.

Journals.

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Chemists' Journal; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; Medical Times and Gazette; The Microscope; Nature; New Remedies; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS:—

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; New Remedies; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

PROGRAMME OF THE PROCEEDINGS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

NINETEENTH ANNUAL MEETING, SOUTHAMPTON, 1882.

OFFICERS.

President.

PROF. ATTFIELD, PH.D., F.R.S., F.I.C., F.C.S.

Vice-Presidents.

(Who have filled the office of President).

PROF. BENTLEY, F.L.S., M.R.C.S., London.
H. B. BRADY, F.R.S., F.L.S., F.C.S., Newcastle-on-Tyne.
THOS. B. GROVES, F.C.S., Weymouth.
PROF. REDWOOD, Ph.D., F.I.C., F.C.S., London.
G. F. SCHACHT, F.C.S., Clifton, Bristol.
W. SOUTHALL, F.L.S., Birmingham.
R. REYNOLDS, F.C.S., Leeds.

Vice-Presidents.

R. CHIPPERFIELD, Southampton.
T. GREENISH, F.C.S., F.R.M.S., London.
PROF. TICHBORNE, LL.D., F.C.S., etc., Dublin.
J. R. YOUNG, Edinburgh.

Treasurer.

C. EKIN, F.C.S., Bath.

General Secretaries.

F. BADEN BENGER, F.C.S., Manchester.
SIDNEY PLOWMAN, F.I.C., London (pro tem.).

Secretary.

PHILIP PRINCEP.

Local Secretary.

O. R. DAWSON, Southampton.

Editor of Year Book.

LOUIS SIEBOLD, F.I.C., F.C.S.

Other Members of the Executive Committee.

A. KINNINMONT, F.C.S., Glasgow.
J. C. C. PAYNE, Belfast.
W. B. RANDALL, F.C.S., Southampton.
P. W. SQUIRE, F.L.S., F.C.S., London.
C. SYMES, Ph.D., Liverpool.
G. S. TAYLOR, F.C.S., London.
J. C. THRESH, D.Sc., F.C.S., Buxton.
C. UMNEY, F.I.C., F.C.S., London.

Auditors.

R. DRESSER, York.
J. SPEARING, Southampton.

Local Committee.

ADAMS, Mr. A., Woolston.
ATKINS, Mr. J., Bournemouth.
ATKINS, Mr. S. R., Salisbury.
BARRON, Mr. W., Cheltenham.
BATES, Mr. W., Southampton.
BIENVENU, Mr. J., Southampton.
BISHOP, Mr. S., Southampton.
BRIERLEY, Mr. J., Southampton.
CHIPPERFIELD, Mr. R., Southampton.
CORDEN, Mr. T., Cowes.
CORY, Mr. J. H., Newport.
DAWSON, Mr. O. R., Southampton.
FRANCIS, Mr. G., Romsey.
HEWITT, Mr. W. W., Cowes.
HUGHES, Mr. J. W., Southampton.
JOHNS, Mr. J. J., Southampton.
JOHNSON, Mr. W. E., Southampton.
MASON, Mr. P. H., Gosport.
MUMBY, Mr. G., Gosport.
MUMFORD, Mr. A., Southampton.
PELL, Mr. J., Woolston.
POLLARD, Mr. H. H., Ryde.
WORTH, Mr. E., Bournemouth.
RANDALL, Mr. W. B., Southampton.
RASTRICK, Mr. R. J., Southsea.
READ, Mr. W., Landport.
SAPP, Mr. A., Basingstoke.
SAPP, Mr. J. J., Southsea.
SINCOX, Mr. E. S. Shirley.
SPEARING, Mr. J., Southampton.
SPINNEY, Mr. F., Bournemouth.
TIGAR, Mr. H. B., Freemantle.
WILLIAMS, Mr. J., Aldershot.
WITHERS, Mr. F., Southampton.

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE

WATTS MEMORIAL HALL, VINCENT'S WALK, SOUTHAMPTON.

ON TUESDAY AND WEDNESDAY, THE 22ND AND 23RD AUGUST, 1882,

Commencing at Half-past Ten a.m. each day.

MONDAY, 21st AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Secretaries, at 8 p.m., at Radley's Hotel.

TUESDAY, 22nd AUGUST.

The CONFERENCE met at 10.30 a.m., adjourning at 1 p.m.; and at 2.30 p.m., adjourning at 5 p.m.

Order of Business.

Reception of Delegates.
Report of Executive Committtee.
Financial Statement.
Report of Treasurer of the "Bell and Hills Library Fund."
President's Address.
Reading of Papers and Discussions thereon.

PAPERS.

1. *First Report on the Difference between the Essential Oils of Cinnamon and Cassia.* By A. H. JACKSON, B.Sc.
2. *Report on the Alkaloidal Value of Belladonna Plants at Various Periods of Growth.* By A. W. GERRARD, F.C.S.
3. *A New Styptic of Indigenous Growth.* By Professor QUINLAN, M.D., etc.
4. *Some Experiments on English Oil of Lavender.* By W. A. SHENSTONE, F.I.C., F.C.S.
5. *Terpin Hydrate; its Preparation and Crystallography.* By R. H. PARKER.
6. *On a New Method of Making the Volumetric Solution for Estimating Hardness of Water.* By Professor C. R. C. TICHBORNE, Ph.D., etc.
7. *Notes on Brazilian Drugs.* By Dr. C. SYMES, F.C.S.
8. *Half an hour with a few sheets of the New Pharmacopœia of the United States of America.* By Professor ATTFIELD, F.R.S., etc.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the Meeting, on invitation of the Local Committee, partook of a Luncheon served in the Ante-Room.

On Tuesday Evening, the Local Committee conducted a party of the members of the Conference on an Excursion to the ruins of Netley Abbey.

WEDNESDAY, 23rd AUGUST.

The CONFERENCE met at 10.30 a.m., adjourning from 1 p.m., till 2.30 p.m. The whole of the business of the Conference was completed this day by about 5 p.m.

Order of Business.

Reception of Delegates.
Reading of Papers and Discussions thereon.

PAPERS.

9. *On some Reactions of Arsenic.* By W. A. H. NAYLOR, F.C.S., and Mr. J. O. BRAITHWAITE.
10. *Some Results of the Action of the Digestive Ferments on Drugs.* By G. BROWNEN, F.C.S.
11. *Remarks on Aconitum Napellus and Allied Species.* By E. M. HOLMES, F.L.S.
12. *On Ammoniated Extract of Ergot.* By A. W. GERRARD, F.C.S.
13. *On Tumefaction as an Aid to the Identification of the Varieties of Maranta Starch.* By W. H. SYMONS, F.R.M.S., F.C.S.
14. *The Purity of Commercial Chloride of Gold.* By F. W. BRANSON.
15. *The Iodides of Bismuth.* By F. W. FLETCHER, F.C.S., and H. P. COOPER.
16. *Vegetable Organisms in Solutions of certain Inorganic Salts.* By A. H. BOTHAMLEY.
17. *The Solubility of Morphia Salts.* By D. B. DOTT, F.R.S.E.
18. *Notes on the Pharmacy of Cinchona.* By R. W. GILES.
19. *Note upon the Action of Glycerine upon some Salts of Iron.* By G. F. SCHACHT, F.C.S.
20. *Note on a Reaction of Glycerin and other Polyhydric Alcohols.* By W. R. DUNSTAN, F.C.S.
21. *The Solubility of Boric Acid in Glycerine.* By D. HOOPER.
22. *Note on a Commercial Sample of Liquor of Iodide of Iron containing some Impurities probably added with a view of retarding or hiding its Oxidation.* By B. S. PROCTOR.
23. *Note on Methyl Orange as an Indicator of the Neutrality of Salts having an Acid Reaction with ordinary Test-papers.* By B. S. PROCTOR.
24. *Variations in Strength of Commercial Samples of Tinctura Opii, B.P., and Extractum Opii Liquidum, B.P.* By J. WOODLAND, F.L.S., F.C.S.
25. *The Purity of the Salts of Silver as met with in Commerce.* By J. WOODLAND, F.L.S., F.C.S.

Place of Meeting for 1883.
Election of Officers for 1882–83.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the meeting, on invitation of the Local Committee, partook of a Luncheon served in the Ante-Room.

THURSDAY, 24th AUGUST.

Most of the Members attending the Southampton Meeting, accompanied by the Local Committee, went for a very pleasant excursion to Ryde, Brading, and Ventnor.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT SOUTHAMPTON, 1882.

THE Nineteenth Annual Meeting of the British Pharmaceutical Conference commenced on Tuesday, August 22nd, at the Watts Memorial Hall, Southampton, under the presidency of Professor Attfield, Ph.D., F.R.S., F.I.C., F.C.S.

The following members and visitors were present during the meetings:—

Barnsley.—T. Lister.
Belfast.—J. C. C. Payne.
Birmingham.—W. Southall.
Blackburn.—Walter Farnworth, William Farnworth.
Bournemouth.—J. J. Shipman, F. Spinney, E. Worth.
Brighton.—J. Padwick, W. D. Savage.
Bristol.—W. Berry.
Cheltenham.—W. Barrow.
Clifton.—G. F. Schacht, W. A. Shenstone.
Cosham.—T. B. Baker.
Cowes (West).—T. P. Saunders.
Detroit (U.S.A.)—H. A. Wetzel.
Droitwich.—E. Taylor.
Dublin.—W. N. Allen, F. J. B. Quinlan, M.D., C. R. C. Tichborne, Ph.D.
Edinburgh.—J. B. Stephenson.
Fareham.—G. S. Dunn.
Fordingbridge.—F. W. Haydon.
Freemantle.—H. B. Ligas.
Gloucester.—A. Meadows, W. Stafford.
Kilmarnock.—J. Borland.
Kingstown—H. Bennett.
Landport.—W. Read.
Launceston.—W. J. Gilbert.

Leeds.—F. W. Branson, G. Ward.

Leicester.—J. W. Clark.

Leighton Buzzard.—R. Richmond.

Liverpool.—C. Symes, Ph.D., A. H. Mason.

London.—P. Akers, A. Allchin, F. Andrews, J. Attfield, Ph.D., G. Brownen, G. M. Burden, H. B. Cocksedge, H. Davenport, J. Deane, C. Ekin, F. W. Fletcher, A. W. Gerrard, J. A. Giles, R. W. Giles, T. Greenish, R. Hampson, W. Hills, E. M. Holmes, F. H. Lescher, A. B. Lewinton, W. Martindale, J. H. Matthews, W. A. H. Naylor, R. H. Parker, F. Pasmore, B. H. Paul, Ph.D., S. Plowman, P. Princep, T. Redwood, Ph.D., R. A. Robinson, A. L. Savory, P. W. Squire, W. H. Symons, H. S. Wellcome, J. Williams, A. C. Wootton, W. A. Wrenn, A. H. Wright, T. R. Wright.

Lymington.—H. Badcock.

Manchester.—F. Baden Benger, A. H. Jackson, B.Sc.

Newcastle-on-Tyne.—C. E. Stuart, B.Sc.

Newcastle (Staffs.)—E. H. Croydon.

Nottingham.—C. E. Patchett.

Reading.—E. Cardwell.

Red Hill.—T. Padwick, F. Sillitoe.

Romsey.—J. Baker.

Ryde.—H. H. Pollard.

Salisbury.—S. R. Atkins, W. R. Atkins.

Sandown (Isle of Wight).—G. Brown.

Sheffield.—J. Preston.

Shepton Mallet.—G. J. Cottrill.

Shirley.—E. S. Sincox.

Southampton.—W. Bates, J. Bienvenu, S. Bishop, J. H. Bray, E. Chipperfield, R. Chipperfield, W. A. Clark, P. Dalgarno, O. R. Dawson, J. J. Johns, A. Mumford, W. B. Randall, J. Spearing.

Southsea.—W. C. White.

Stevenage.—J. F. Fresson.

Swansea.—N. M. Grose, J. Hughes, M. Jones.

Tottenham.—C. T. Kingzett.

Tunbridge Wells.—B. Whitrow.

Weymouth.—T. B. Groves.

Wigan.—J. Phillips.

Winchester.—D. W. Gibbs.

Yeovil.—T. C. Maggs.

York.—J. Clark, R. Dresser.

Meeting of the Executive Committee.

A meeting of the Executive Committee was held at Radley's Hotel, on Monday, Aug. 21st, at 8 p.m.

Present: Prof. Attfield, F.R.S., etc., president, in the chair; Messrs. Groves, Schacht, Chipperfield, Greenish, and Tichborne, vice-presidents; Mr. Ekin, treasurer; Messrs. Benger and Plowman, hon. secs.; Messrs. Barron, Dawson, Payne, Randall, Spearing, Squire, and Symes.

The minutes of the previous meeting were read and confirmed.

A letter was read from Professor Bedford, addressed to the President, inviting him to bring before the notice of the members of the Conference some proof sheets of the new United States Pharmacopœia.

The programme was discussed and the order of papers arranged. One paper was considered by the Committee unfitted to the objects of the Conference, and the Secretaries were instructed to ask the author to withdraw it.

A draft report of the Executive Committee for presentation at the Annual Meeting was submitted by the Honorary Secretaries, and after some alterations was adopted.

The Treasurer's financial statement was also adopted.

Letters were read from the Southampton Local Secretary relating to the books usually presented from the Bell and Hills fund. They contained the suggestion that as no Association of Chemists existed in the town, the books should be placed in the library of the Hartley Institution (under the same rules as those of the Medical Society) for reference by the local chemists, and that power should be reserved to remove them if at any future time an association should be formed. This, after some discussion, was agreed to.

A letter of thanks for copies of the *Year-Book* from the North British Branch of the Pharmaceutical Society was read.

A number of members whose subscriptions were more than two years in arrear were ordered to be removed from the list.

It was resolved to issue a circular to all registered chemists of Great Britain not already connected with the Conference, inviting their support. At the suggestion of Prof. Tichborne and Mr. Payne it was decided to extend this invitation to the chemists of Ireland.

Letters were read from the Aberdeen Society of Chemists and Druggists, inviting the Conference to meet in their town in 1883 or 1884.

Twenty-eight gentlemen were elected to membership.

GENERAL MEETING.

Tuesday, August 22nd.

At the commencement of the proceedings, Mr. W. B. RANDALL (Southampton), Chairman of the Local Committee, said he was deputed by his brother pharmacists to say how pleased they were to see the British Pharmaceutical Conference meet at Southampton. The gentleman who conveyed the invitation to the Conference at York last year mentioned certain disabilities under which they laboured in undertaking this duty; but notwithstanding that, with the help of their brethren in the neighbourhood and of some friends at a distance, they trusted they had been able to make such arrangements as would make members of the Conference comfortable and minister to their enjoyment during their visit. They could not say at Southampton that they were favoured by nature with those mineral treasures which added so greatly to the population and wealth of the localities where they were found, but they might boast, perhaps more than some of those localities, of the beauties of nature, and he ventured to think that this was as good a part of the country to work in, and to enjoy life in, as those parts where there might be more mineral wealth. It was quite certain that the monks of old thought this locality a good one, and they were not bad judges, for they put up Netley Abbey, of which the stately ruins might still be seen. The Government of our own day had much the same feeling, for they erected Netley Hospital close to the ruins of the Abbey. The old Norman kings too must have thought something of the South of England, for they made their hunting grounds in the New Forest, and Her Gracious Majesty the Queen and her lamented Consort appeared to have thought the same when they chose Osborne as one of their royal residences. He might say something too, if time permitted, about the historic associations of Southampton. It was there, he believed, that Canute gave that celebrated rebuke to sycophancy which all would remember, and that lesson in reverence which was now-a-days, he believed, equally needed. In that neighbourhood too, in his early days, ran about a man who had taught some amongst them the close observation of nature, when he recommended them to imitate the industry of the busy bee, and who also taught many of them their first lessons in logic, for his handbook on that science had the honour for some time of being the text-book in one of the universities. He alluded to Dr. Watts, after whom the building in which the Conference was

assembled had been called, and on whose father's garden it stood. He would detain them no longer from the address they were anxious to hear, but in the name of the pharmacists of the south-western district, including those resident in the Garden of England across the Solent, he bid the British Pharmaceutical Conference welcome to Southampton.

The PRESIDENT, in the name of the Conference, thanked Mr. Randall for the kind words of welcome he had uttered. He begged also to express the hope that, in return, the meeting of the Conference might be the means of doing some good to the pharmacists of Southampton and the district.

RECEPTION OF DELEGATES.

Mr. F. B. BENGER (General Secretary) then read the list of delegates from various societies, who were collectively welcomed by the President.

The following is a list of those present :—

From the *Pharmaceutical Society of Great Britain.*—Mr. S. R. Atkins (Vice-President) ; Messrs. F. Andrews, T. Greenish, F.C.S., F.R.M.S., R. Hampson, W. D. Savage, G. F. Schacht, F.C.S., P. W. Squire, F.L.S., F.C.S., C. Symes, Ph.D., F.C.S., and J. Williams, F.I.C., F.C.S.

From the *North British Branch of the Pharmaceutical Society.*—Messrs. Borland and J. B. Stephenson.

From the *Pharmaceutical Society of Ireland.*—Professor Tichborne, Ph.D., F.I.C., F.C.S. (President); Messrs. W. N. Allen, H. Bennett, and Payne.

From *Birmingham.*—Mr. Southall.

From the *Brighton Association of Pharmacy.*—Messrs. Padwick and W. D. Savage, J.P.

From the *Bristol Pharmaceutical Association.*—Mr. G. F. Schacht (President).

From the *Liverpool Chemists' Association.*—Mr. Mason and Dr. Symes.

From the *Leeds Chemists' Association.*—Messrs. F. W. Branson and G. Ward, F.C.S., F.I.C.

From the *Leicester Chemists' Assistants and Apprentices' Association.*—Mr. J. W. Clarke.

From the *London Chemists' Assistants' Association.*—Messrs. W. A. Wrenn (President), and C. E. Stuart, B.Sc.

From the *Manchester Chemists and Druggists' Association.*—Messrs. F. Baden Benger, F.C.S., and A. H. Jackson, B.Sc.

From the *Sheffield Pharmaceutical and Chemical Society.*—Mr. J. Preston (President).

From *York.*—Messrs. Clark and Dresser.

Mr. BENGER then read the report of the Executive Committee, as follows :—

REPORT OF THE EXECUTIVE COMMITTEE.

Since the last general meeting of the Conference at York, your Committee have met on several occasions in London, chiefly for the transaction of business connected with the publication and distribution of the *Year-Book*, the issue of the Blue Lists and other circulars, the collection of members' subscriptions, and the organization of the present meeting.

At a meeting held in December, Mr. Siebold was reappointed editor of the *Year-Book* for 1882. The manuscript of the forthcoming volume, so far as it can be completed up to this date, has been placed on the table. There remain to be added to it the Introduction, the Bibliographical section, the Transactions of the Conference at this meeting, and the Index.

Members will have observed that in the *Year-Book* for 1881 the various alterations and improvements alluded to in the last Report of your Committee have been carried out. A new section, "Bibliography," comprising titles of books, pamphlets, etc., on chemistry, botany, materia medica, pharmacy, and allied subjects, published between July 1, 1880, and June 30, 1881, has been added. The abstracts are somewhat more condensed than in former years, and are more numerous, one of the lists of members—that in which the names were classified under those of the cities and towns in which they reside—has been omitted, and better paper has been employed. The issue of a general index has been postponed for financial reasons.

It being very desirable to enlist the sympathies and secure the friendly co-operation, in Conference matters, of colonial pharmacists, as far as possible, steps have been taken to place the Blue List of subjects suggested for investigation in the hands of the principal pharmacists residing in some of the British Colonies. In carrying out this arrangement, the assistance of local Pharmaceutical Associations has been kindly afforded. Your Committee have already been informed of the distribution of the papers sent to Victoria, and twenty-one applications for membership have already been made in consequence.

Letters have been received from Mr. Bosisto, the President, and Mr. Shillinglaw, the Secretary of the Victoria Pharmacy Board, expressive of the cordial interest taken by them in the proceedings of the British Pharmaceutical Conference, and offering to distribute, at any time, Conference circulars free of cost.

One application only for a grant in aid of research has been made, that of Mr. Alfred H. Jackson, B.Sc., of Manchester. The sum of £10 has been placed at this gentleman's disposal for the purchase of materials wherewith to conduct an examination of the essential oils of cinnamon and cassia, with a view to discover some chemical or physical distinctions. Mr. Umney was good enough to undertake the distillation of these oils from the respective barks, thereby guaranteeing their purity, and Mr. Jackson will present a first report to the present meeting. Mr. Gerrard, to whom a grant was voted last year, has continued his investigations on the relative values of wild and cultivated belladonna, and on the activity of the various parts of the plant, and will furnish a further report.

Mr. H. G. Greenish, who was also the recipient of a grant last year to aid his investigation of the principles of *Nerium Oleander*, writes, "The publication of the results that I have hitherto obtained would probably lead only to confusion, as they involve the modification, to a certain extent, of statements made in a 'Preliminary Note,' published in the *Pharmaceutical Journal* some time since, and are in themselves but incomplete." The reception of Mr. Greenish's report is therefore postponed.

Your Committee take the opportunity of again reminding members that there are funds ready to be placed at their disposal, to defray the cost of materials used in the investigation of subjects suitable for Conference Reports, and they cannot refrain from an expression of disappointment that so few avail themselves of this assistance.

Your Committee regret the loss of the valuable services of one of the Honorary General Secretaries. Mr. Carteighe, having been elected President of the Pharmaceutical Society of Great Britain, felt it to be his duty to that Society to resign the position as Secretary he held with us.

Mr. Sidney Plowman, F.I.C., having been asked by his fellow members of the Committee to act provisionally as an Honorary Secretary until an appointment could be made, has consented to do so.

Fifty-seven gentlemen have been elected members since the last annual meeting.

Mr. Ekin (Treasurer) then read the following Financial Statement:—

Financial Statement for the Year ending June 30th, 1882.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

Dr.

	£	s.	d.
To Balance in hand	282	9	10
,, Sale of Year-Book by Publishers	26	6	8
,, ,, ,, Secretary	5	12	6
,, Advertisements, 1879 vol.	0	12	0
,, ,, 1880 vol.	8	10	0
,, ,, 1881 vol.	103	6	6
,, Subscriptions from Members	661	7	3
July. To Dividend on £250 Consols	3	13	5
1882. Jan. ,, ,,	3	15	5
,, Feb. 15. To Interest on Deposit	3	5	4
	£1098	16	11

Cr.

	£	s.	d.	£	s.	d.
By Expenses connected with Year-Book:—						
Printing, binding, and distributing	£467	0	0			
Editor's Salary	150	0	0			
Advertising and Publishers' charges	30	7	8			
Foreign Journals	3	19	0			
				651	6	8
,, Grants in aid of Research				20	1	11
,, Secretary's Salary				100	0	0
,, Printing and Stationery				37	12	2
,, Sundry Expenses				3	13	3
,, Postage				44	7	3
,, Expenses of York Meeting				18	7	4
,, Secretary's Expenses, York Meeting				6	0	0
,, Balance at Bank	£212	9	9			
,, Cash in Secretary's hands	4	18	7			
				217	8	4
				£1098	16	11

		£	s.	d.
Assets July 1st, 1882	Cash in hand	217	8	4
	Consols (stock)	250	0	0

The Bell and Hills Fund.

	Dr.	£	s.	d.
1881.	To Balance in hand	25	9	10
July.	To Dividend on £350 Consols	5	2	10
1882.				
Jan.	" "	5	2	10
		£35	15	6

Cr.	£	s.	d.
By Purchase of Books for York	10	10	6
" Balance at Bank	25	5	0
	£35	15	6

		£	s.	d.
Assets July 1st, 1882	Cash in hand	25	5	0
	Consols (stock)	350	0	0

Audited and found correct, RICHARD DRESSER, JAMES SPEARING, *Auditors.*

The President, in moving the adoption of the report, said he trusted the Conference would be satisfied with the work of the Committee during the year. He would remark, in reference to the small deficit which marked the operations for the year, that the Committee did not seek to save money; it desired to spend every penny received. In past years, more by accident than anything else, the Conference had accumulated £300 or £400, which was quite sufficient to stand between it and bankruptcy, and he should be quite satisfied if that amount remained to its credit. As to whether in any year there might be a deficiency of a few pounds, or an increase of a similar amount, need not cause much trouble. If any one had any misgivings on this point, however, he might reflect with satisfaction that very shortly a post-office parcels post would be in operation, which would save at least 2*d.* per volume in the delivery of the *Year-Book.* But when the Conference came to ask the registered chemists and druggists of the country, who were not already members of the Conference, to become so, he thought there would be such an increase of membership as would remove any possible difficulty there might be in the way of finance. With regard to the general index to the *Year-Books*, to workers at pharmacy it would be a great advantage to have a general index

to the whole of the volumes, and two years ago it was suggested that such a general index should be published. The Committee had considered the matter carefully, and were somewhat surprised to find that the production of such a work would cost a considerable sum, and just now they did not happen to have funds in hand for that purpose. He had no doubt that in the course of a year or two such funds would be forthcoming, and one of the first objects to which they would be applied would be the production of the general index.

Mr. W. D. SAVAGE (Brighton) seconded the motion, which was then put and carried unanimously.

THE BELL AND HILLS FUND GIFT OF BOOKS.

Mr. EKIN said he was happy to be able to state that the Local Committee saw its way to accept the gift of books from the Bell and Hills Fund, and to make arrangements by which they would be available to all the chemists of Southampton. He regretted that it had not been decided a little earlier, so that the books might have been presented on the spot; but the selection had been made, and they would shortly be sent to Southampton.

Mr. RANDALL said the pharmacists of Southampton accepted this gift with very much pleasure and thankfulness, and they hoped it might lead some day to their having their own place in which to keep and use these books, and even to something beyond that. If it did, it would have done considerable good, and he must say, in his opinion, the donors of this gift had done great good by giving such practical lessons in the value of a good library.

Mr. SIDNEY PLOWMAN (General Secretary) then read the following letter from Professor P. W. Bedford, President of the American Pharmaceutical Association:—

"Professor John Attfield, Ph.D.,

"President, British Pharmaceutical Conference.

"Dear Sir,—Allow me to congratulate yourself and the Conference on the assured success of the coming meeting at Southampton, and to express my regret that I have to do by letter what I would far rather do in person. I had hoped that ere this I should have had the pleasure of attending one of the gatherings of the British Pharmaceutical Conference, but it is still one of the prospects of the future.

"I trust that in numbers it will be the largest meeting yet held;

in papers, most numerous; in discussions, most profitable; in social pleasure, the most enjoyable.

"I recently forwarded to you proof sheets from the corrected plates of the first ninety-six pages of the text of the forthcoming U.S. Pharmacopœia; and, with this, I have the pleasure of sending the succeeding forty-eight pages; all that are as yet in presentable condition.

"It will serve to show yourself and friends of the British Pharmaceutical Conference, that it will be a work worthy of the labour bestowed upon it

"It is the only copy that has gone outside our Committee, and I take pleasure in sending it to one that has honoured his own land by his worthy work in the cause of pharmacy, and in our own land is as well known by his scientific labours in our profession. Another tie exists: it is the remembrance of the practical sympathy and interest which years ago was extended to those of our profession who saw their College of Pharmacy vanish in the flames.

"The annual meeting of the American Pharmaceutical Association follows close after that of the Conference. I trust that it may be possible for us at that meeting to extend a cordial welcome to some of our fraternity from England.

"May the British Pharmaceutical Conference ever prosper, ever be an active promoter of the true welfare of our profession, and stand as an able exponent of the best talent of pharmacy in England.

"Very sincerely Yours,

"P. W. BEDFORD,

"*President,*

"*American Pharmaceutical Association.*"

Letters expressing regret at not being able to be present had also been received from Mr. Richard Reynolds, late President of the Conference, Professor Bentley, Messrs. Siebold, Umney, Stanford, Proctor, Young, Taylor, Thresh, Kinninmont, Frazer, and others.

The PRESIDENT then delivered his address as follows:—

THE PRESIDENT'S ADDRESS.

The Relation of Pharmacy to the State.

Pharmacy, in every country, has high duties to perform towards the State. The humble handmaid of Medicine, she has to aid in maintaining that greatest of physical blessings, health; to aid in

restoring those from whom that blessing is temporarily withdrawn; and to aid in soothing the life of those to whom that blessing will never come again. From earth and sea, and the living things they foster, pharmacy draws forth drugs new and old, gives them convenient shape, and distributes them to the community. Ever conservative, she searches the whole globe for supplies of medicaments, well known, well tried, and reliable; ever progressive, she searches the realms of nature and the regions of art for new materials wherewith to aid in combatting disease and death. And when she has found her *materia medica*, she is unwearied in elaborating them, and unremitting in her endeavours to place them —by her possibly too competitive and too varied agencies—at the door of every dwelling in the land. Exhaustive research, careful manufacture, thorough distribution: these are the means by which her duties are fulfilled.

Is pharmacy performing those duties with the maximum of efficiency, either in the world generally or in any country particularly? Can she better search, better elaborate, better distribute? Can she in any way better meet the public demands made upon her? Can she better serve mankind, either herself directly, or through the profession of medicine? Is she performing any one of her duties better in some countries than in certain others; and, if so, can the international agencies for the exchange of pharmaceutical information be improved in character or wisely increased in number? Is a community best served, in the matter of pharmacy, by a large number of distributors of elaborated drugs, only a few persons being manufacturers of the preparations; or by a smaller number of distributors, each of whom makes his own preparations? Can the followers of pharmacy show the civilised States of the world, or show the Governing Body of any one State, how legislative enactments, new or extended, will better enable her to perform her high duties?

These are vital questions—vital to the health and therefore to the happiness of society, vital to pharmacy.

They are questions which may well form the subject of an address on the present occasion to a non-political society of pharmacists—the British Pharmaceutical Conference. For with one exception, the last, which will only receive such notice as previous presidents have given to the practical politics of pharmacy, the questions lie outside the area of legislation and administration. Lying also, as they do, outside the area of that original pharmaceutical research, the promotion of which is the chief object of the

Conference, their consideration will form an agreeable relief to our deliberations on more technical matters.

They are questions which should strike home to pharmacists as individuals. For does any follower of pharmacy desire to promote even his own sole interest? Let him remember that the better he performs the duties the public require him to do, and have put him amongst his drugs to do, the greater will be his personal success. Let him reflect that he is only one member of the pharmaceutical body, and that in the degree in which he contributes to the welfare of the whole body does he promote his own welfare. Let him never forget, in short, that in pharmacy, as in every other walk of life, the highest self-interest is to be found in the forgetting of self. The requirements of the public have called him into existence, the requirements of the public maintain him in his position, only in proportion as he meets the requirements of the public will he promote his own interests or raise either himself or his calling.

COLLECTION; PREPARATION; DISTRIBUTION.—We must glance at the present condition of the machinery with which we perform our pharmaceutical duties before we can usefully consider possible improvement.

COLLECTION: In searching for supplies of the old and well tried natural drugs, pharmacy presses into her service natives of many climes and traders of many nationalities. In growing those drugs more or less artificially, she employs thousands of workers in all countries. In making her more strictly artificial saline remedies, she contributes to the support, is often the chief and sometimes the only support, of the chemical industries of Europe and America. And in the exercise of her demands for new remedial agents, she looks to the original researches and discoveries of the traveller, the botanist, the zoologist, the mineralogist, the scientific chemist. Her followers themselves largely conduct original research and discovery; they also largely foster research and discovery by banding themselves into Societies, Associations, and Conferences, for the initiation of original pharmaceutical research, for the payment of expenses incurred in research, and for the free publication of the results of research.

PREPARATION: To manipulate raw drugs and to manufacture compounded drugs is perhaps pharmacy's most special duty, the work which gives to pharmacy a distinctive stamp amongst man's many vocations. For it is her peculiar art to find the fittest form in which the animal product, the medicinal plant, or the crude mineral shall most directly, easily, and even pleasantly it may be,

do the work it is designed to do. From the plant, animal, or mineral which observation or more minute research has shown to have medicinal value, pharmacy must carefully, step by step, and constantly testing progress, eliminate what is valueless, until she is able to say that a simple aqueous infusion or decoction contains all the activity of the raw material. Perhaps she finds that the active matter is only removable by more spirituous fluids, and hence produces a "tincture." Maybe she proves that the aqueous or spirituous fluid, without harm and with some advantage, may, by the boiling away of the solvent, be concentrated to a soft solid or "extract." Possibly, after much labour, she obtains from the crude drug one or more of the actual principles in which reside its activity; extracting such an alkaloid as quinine, such a substance as salicin, such a body as citric acid, such a salt as cream of tartar. Whether she always extracts the active principle or not, she must ascertain its properties in order that its presence may at any time be verified, or perhaps its purity be demonstrated, and in order that she may avoid mixing antagonistic or incompatible drugs when she distributes compounded drugs to the public.

To accomplish this manufacturing or manipulative work, either all or some of the followers of pharmacy must possess extensive knowledge. They must have sufficient preliminary education and mental training to enable them intelligently to study the scientific books they will have to master, and to comprehend the principles on which their work is based. They must as pupils give a few years to the acquirement of *materia pharmaceutica*, in order that they may be familiar with the standard physical characters, the general medical qualities, and the commercial importance of the many hundreds, if not thousands, of elaborated materials or mixtures of materials which they desire, sooner or later, to prepare for themselves. They must have some knowledge of botany, as well as of animal and mineral products, or they will not be able to judge of the raw materials with which they will have to deal. They must have a fair knowledge of the natural forces and of mechanics, or they will not be able to convert the raw drugs into preparations having the maximum of medicinal activity and convenience of form or shape, with the minimum of unpleasant flavour, odour, and appearance. They must have a considerable knowledge of chemistry to enable them to judge of the qualitative character of many drugs, and the quantitative character of most, the purity of the chemical substances which they purchase, the state of activity of preparations that have been long in stock, the com-

patibility or incompatibility of the components of mixtures they are called upon to prepare. A very large amount of such professional and commercial knowledge must be forthcoming somehow and somewhere from the pharmaceutical body for pharmacists rightly to do their duty to the State, as elaborators, or manufacturers, or compounders of drugs. Whether all pharmacists or only some should possess this knowledge, is a question yet to be discussed. The point up to which division of labour is desirable and beyond which it is undesirable, will be considered subsequently.

DISTRIBUTION: In every civilized state somebody must bring drugs within reasonable reach of every household. Very different agents perform this duty. There is, first, the pharmacist proper, who is not only a distributor but a manufacturer or compounder of most pharmaceutical preparations he distributes; the man who can warrant the purity and efficiency of every drug he distributes, either because he has tested it, or because he has made it himself from materials which his professional knowledge tells him to be trustworthy; the only pharmacist, therefore, who can offer a personal guarantee that the medicine prescribed by a physician will, as medicine, have the effect intended. There is next the druggist, who makes few, if any, compounds, trusting for their purity and efficiency to wholesale manufacturers, and who is able to test few, if any, of the articles supplied to him; but who has such experience of pharmacy as well fits him to supply a widespread demand for drugs—especially in suburbs of cities, and in the small towns and the villages of a country. Third in importance as a distributor of drugs, is the general practitioner of medicine, who, if he even has less knowledge of drugs than the druggist just alluded to, supplies an important demand, not only where pharmacists could do the work, but in outlying country districts remote from a druggist's shop of any kind. Fourthly, the distribution of drugs is effected, to some extent in the aggregate, in certain countries, by shopkeepers other than druggists; that is to say, by grocers, drapers, and such vendors, who admittedly know nothing about drugs, and who, except that they buy in bulk from the wholesale dealer or manufacturer, and retail in small quantity, sell the drugs in the state in which they are received. Lastly, drug distribution, of a kind, is, in some countries, extensively accomplished by the agency of portable proprietary preparations termed "patent," though only so-called now-a-days, in a *lucus a non lucendo* sense, the composition of most of them being a secret. These compounds pass from the producer to the consumer, either by the agency of the retail dealer, often but

not always a pharmacist, or through the post-office. The maker of the "patent medicines" may or may not be a person having knowledge of drugs, and may not even reside in the country in which his articles are sold, therefore may not be legally responsible for any harm caused by their use or misuse.

The relative numbers of these five classes of drug distributors doubtless vary considerably in different countries, and probably cannot be ascertained for any one country. In Great Britain, for instance, there are some thirteen thousand registered "Chemists and Druggists," but how many of these are in business on their own account, and how many are assistants who have passed the qualifying examination, we do not know; nor do we know how many of those in business on their own account are mere vendors of drugs, and how many can give, respecting all their drugs, the personal guarantee of purity and efficiency already alluded to. There are twenty-three thousand registered practitioners of medicine in Great Britain and Ireland, but how many of these are direct distributors of medicines we do not know. What amounts of drugs are annually sold by grocers, drapers, and other non-pharmaceutical vendors we do not know. Patent medicine stamp duty to the amount of nearly £140,000 was paid into our Inland Revenue in the year ending March 31, 1881, which is equivalent to at least one million of pounds as the present annual payment by the public for secret remedies. But many proprietary medicines are not liable to stamp duty; so that the extent to which drugs are distributed in this way we do not quite know, though it is obviously very considerable.

Thus far the position of pharmacy in relation to the State has been defined, and an outline given of the means or method or machinery—partly haphazard, partly almost naturally evolved—by which pharmacy performs her State functions of collecting, elaborating, and distributing drugs.

Does this existing condition of pharmacy admit of improvement? If so, in what directions?

These are questions of great importance to the community. They also are of the highest importance for the pharmacist, both from the point of view of bounden duty to the State, and from that of obvious self-interest.

That the pharmacy of the present day admits of improvement will probably be admitted by the pharmacists of every State. What human institution does not? But respecting the directions in which improvements may be effected, the period at which they

may be introduced, and the rate at which they may be carried out, there will be differences of opinion, especially as regards different States. The pharmacists of each separate nation must therefore separately discuss this question, at all events, as a preliminary step to international discussion at any future time. Our own discussion of the relation of pharmacy to the State will at present be carried on solely from the British standpoint.

COLLECTION; ELABORATION; DISTRIBUTION. Let us again in this order consider the general direction of possible improvements in our important and honourable State relations: our relations on the one hand to remedial agents, and on the other to our fellow-countrymen, who all, at one time or other, need remedial agents.

COLLECTION, including, as already indicated, commercial investigations and original research. The therapeutical importance of quinine and morphia have secured attention to the cultivation of the cinchona tree and the opium poppy; but for the vast majority of vegetable drugs, we still have to rely, as regards quality, on the somewhat capricious kindness of unaided nature, and as regards quantity and quality, too often on the good and bad consciences, and perhaps commercial cupidities, of more or less ignorant and irresponsible collectors. Why should not drug farms be more generally established, even in Great Britain? Is land required? Many food farms are being thrown out of cultivation in this country. Would farming other than food farming be likely to be remunerative? Flower farming and fruit farming are among the most lucrative callings in these islands. Could not some pharmaceutical body emulate the Royal Agricultural Society with its Woburn experimental farm? May we not hope that a Lawes will arise in pharmacy, who, founding a Rothamstead, will pioneer us towards the successful scientific cultivation of most of the medicinal plants. The area of pharmaceutical research, in the largest sense of that term, including improved modes of collecting as well as of investigating drugs, could be extended by the State, by societies, and by individuals. But State aid to research of any kind is almost necessarily accompanied by State control, and some peoples are impatient of control, and do their duties to their calling and to the public with the maximum of efficiency in an atmosphere of freedom. State aid in carrying on research in pharmacy would probably be less effective than internal effort, hence improvement in pharmaceutical research by such aid is scarcely to be expected. Internal effort to improve and extend pharmaceutical research may come from societies and from individuals. And already in Great Britain the

Pharmaceutical Society and the Pharmaceutical Conference have given good aid to research, especially in affording opportunities for individuals in pharmacy to bring their researches before their fellow pharmacists, to publish researches without expense, and in the case of the Conference to carry on researches at diminished expense. But any really comprehensive scheme of aid to research by societies, as societies, needs far more ample funds than those at the disposal of the bodies just named; and the source of such funds is not obvious so long as two-thirds of the pharmacists of the country stand aloof from the other third in all matters pertaining to the general pharmaceutical welfare, withholding even that small annual subscription which, contributed by the many, would allow of so much good in many directions being accomplished. In the matter of pharmaceutical research by individuals, English pharmacists, even with the limited aid of the Pharmaceutical Society or the Pharmaceutical Conference, are holding their own, let us hope, but not much more. Such men as a Deane, a Morson, or a Squire need no incentive. Force of character and love of truth for its own sake have always and will always bring a few such men to the front, but we can never hope to see many there. The educational endeavours at the headquarters of the Pharmaceutical Society during the past forty years have always included efforts in the direction of the encouragement of research, and associations of students and assistants for the prosecution of investigations, more or less original, have been the immediate outcome, a subsequent result being the enleavening spread of active workers at original research, and men having sympathy with original research, throughout the whole country. The introduction of compulsory examination into British pharmacy in 1868 was expected to result, *inter alia*, in such an impetus to education as would carry large numbers of young pharmacists into the region of original investigation. That such an impulse has not resulted, that the cause of the failure has been detected, and that a remedy has been found and is to be applied forthwith, are now matters of history. Soon again will every young pharmacist in this country have such opportunities for acquiring sound pharmaceutical education as will start him fairly on the road to research; and we may reasonably expect that a certain proportion will continue to travel along that grand highway. Sooner or later, therefore, Great Britain, let us hope, will be not only abreast, but ahead, of other countries in the matter of pharmaceutical discovery; that is to say, in the matter of a more extended and trustworthy *materia medica*.

In the matter of the improved collection of drugs, therefore, including the development of the maximum activity of medicinal plants and general control over their growth, and including the prosecution of those branches of original research which shall extend the number and the definiteness of drugs, there is room for great improvement in English pharmacy.

ELABORATION: Is a State best served, as regards pharmacy, by a large number of distributors of elaborated drugs, only a few persons being manufacturers of the preparations, or by, probably, a smaller number of distributors, each however making his own preparations? "A smaller number," because, in any calling, the greater the skill, knowledge, and intelligence of its followers, the greater their reasonable expectations of remuneration, and therefore the fewer that can be supported by the community. Now, in Great Britain, unquestionably, the tendency—at all events during the past fifty years—has been for fewer and fewer of the distributors of drugs to manufacture their own medicinal preparations, the retailer relying for these more and more on wholesale manufacturers. Is this practice likely to promote the interests either of the public or of the pharmacist himself? In dealing with a druggist for drugs, simple or compound, the public expect to be served with what is trustworthy. The vendor is a "chemist" as well as a druggist; therefore, presumably, he can chemically verify the trustworthiness of those of his drugs which have chemically definite characters. But he is a "druggist" as well as a chemist; therefore, presumably, he can guarantee the trustworthiness of his non-chemical drugs and drug-compounds. How can he do this if he has not himself prepared those compounds? For they cannot be assayed chemically. Nay, if he has not himself made them from the raw drugs, and thus by long acquaintance with the latter become thoroughly familiar with them, and a thorough judge of their character, how can he guarantee the quality even of what few drugs he may sell in the raw state? Further, if a druggist has not made his own preparations, and has not frequently tested those he purchases—because he himself cannot test them, or because they are beyond the grasp of chemical analysis,—is he one whit the superior in pharmacy to his neighbour, the medical practitioner? Possibly both purchase their compounds of the same wholesale dealer. And if such a *soi-disant* druggist is not more of a druggist than the medical practitioner, where is the foundation for the hope that the medical practitioner will some day turn over all his medicine-making to the pharmacist?

Again, if the druggist is only a distributor and not a compounder or elaborator or manufacturer of drugs, has he much more claim to be even a distributor than a grocer or any other trader who buys or distributes drugs? Is the State much better served by one of these distributors than by the other? Let there be no misunderstanding here. The cry of "drugs for the druggist" is a good and wise cry, but only when founded on the druggist's knowledge of drugs, and on his personal guarantee of their efficiency,—a guarantee founded, as before stated, on his having either made or frequently tested all, or practically all, of his preparations. If he merely buys and sells them, without such personal knowledge, he cuts his own professional platform from beneath his feet. Having taken up the ground of a mere trader, can he wonder if other more astute traders beat him on that ground. Neglecting what ought to be his own cherished art of elaborating or compounding his preparations, can he wonder if he has to relinquish that remuneration, those profits, which were born of the times when the druggist was such a manufacturer, and which profits are still enjoyed by those who do so manufacture. Relinquish them he must if he deliberately labours on the lines of mere trade. In these days of over-population and, consequently, keen competition, no other result can ensue. It is a case of reaping what is sown. And the sooner such a man realizes his position and adds to his trade the trades of those who otherwise will supplant him, the sooner will he be saved from ruin. This differentiation between trading retail druggists and manufacturing retail druggists is already going on. Afterwards there will be another. Some day what remains of the trading retail druggist's trade in drugs will flow away from him to the counter of the manufacturing retail druggist, even though the latter be charging higher prices; for in proportion as purchasers find they cannot judge for themselves, they will go to those who can judge for them. Then if the trader has cultivated other trades, he will have them to fall back upon. Fortunately, in the long run the fittest must survive: the fittest tradesman who is only a tradesman, and the fittest pharmacist who is a tradesman and a professional man too. Does the pharmaceutical apprentice of to-day desire future pharmaceutical success? Let him master the principles of his art. Let him practically learn how, by the aid of chemistry and botany, to test the quality of most of the articles he works with, and how to manufacture most of those that cannot be tested.

Broadly, as a matter of self-interest and sound policy, the prepara-

tion of medicinal compounds by a few druggists only, and their mere distribution by the many, is a practice to be deprecated. Clearly, too, it is to the interest of the public that every druggist should be really, as well as nominally, a druggist,—a man who is able to test or to manufacture every one of his own preparations. All efforts to secure future drug-dealing and drug-working to druggists must be founded on personal professional knowledge possessed by every pharmacist A medical practitioner purchasing drugs at all, will surely prefer to obtain them from the neighbouring druggist rather than from a distant source, if he knows that the druggist can give the guarantee of genuineness that he himself cannot provide, and if they can be obtained at a reasonable price. May he not in many cases go further, and give up dispensing bodily, if in the matter of trustworthiness of materials the druggist can beat him, and if, of course, neither he nor his patient suffer too severely in pocket? For the practitioner will thus get that personal guarantee which should be the druggist's most treasured possession, a guarantee which must, in the nature of things, be stronger when afforded by a neighbour than when offered by the distant dealer, especially when in the latter case it is only afforded at second hand by a price list or a traveller. Contrast the value of the guarantee of a retailer who is also a maker, with that of a druggist who can only trust to the respectability of a maker separated from him by two or three different agents and by scores or hundreds, if not thousands, of miles. Some preparations will doubtless always be better made by one man than by another, or by few persons rather than by many. Let us do nothing to damp the ardour of discoverers, inventors, or originators, in great things or in small. And let us always welcome to our shores anything of excellence that may be offered to us by other countries. But if pharmacy has anything to do with the health and welfare of a State, and if that health and welfare are affected by the personal skill, knowledge, and ability of the pharmacist, let us avoid those false but specious principles, and those falser and more specious practices, which would sink pharmacists to the level of mere traders, mere dealers, mere agents, worthy and honourable enough in their sphere though such men might be.

In the matter, then, of the elaboration of drugs by all druggists, as against elaboration by a few druggists and distribution by the many, there is room for great improvement in English pharmacy; for it would be idle to deny that the preparation of his own compounds is the exception rather than the rule with the British pharmacist. No doubt druggists who are manufacturers as well as

retailers of the preparations on their shelves, may readily enough be found; but it is a fact that many druggists scarcely make even their own pills, but purchase them of wholesale makers (or even only of dealers) who reside, it may be, in quite another county, possibly in another country or in another continent altogether. What can such a druggist know of the quality of such articles? He urges the respectability of their maker. But how much can he know of the characters of makers separated from him by an ocean? After a time prominent makers may be severely pressed by more obscure manufacturers, and he may be dealing with some of the latter, whose probity, with a sense of responsibility naturally diminished by distance, may have given way. In purchasing preparations cheaper, as such a druggist thinks, than he can make them himself, and, still sadder to say, perhaps better looking, is he not buying pottage with the coinage of birthrights? Is he not dealing disastrously with his own interests, and with those of the State, in which he is after all but a steward?

Into the question of improvements in the elaboration of particular drugs it is not desirable now to enter; first, because it is dealt with in the list of subjects for research annually issued by the British Pharmaceutical Conference; secondly, because the spirit of emulation will not permit it to pass out of sight; and, thirdly, because it would be unwise to dwarf the importance of the main question just considered.

Distribution: Given a body of pharmacists, each member of which can, respecting his drugs and drug compounds, supply either the analytical or the synthetical guarantee of efficiency and trustworthiness, then a State is best served by drug distribution being limited, on the whole, to such a body. Limited as a rule. For just as some drug-compounds will probably always best be prepared by the few and distributed by the many, so the distribution of drugs to dwellings remote from towns will probably always have to be accomplished by mere distributors. The main limitation of drug-supply to the public should, however, be to qualified druggists—men who prepare as well as distribute. The public in a sparsely populated district might purchase drugs of a mere distributor rather than do without them, especially if the real manufacturer were not far off, and whose personal guarantee were available at the cost of a long walk, or a drive, or a short railway journey—just as the services of a solicitor's confidential clerk, or of a medical practitioner's assistant, will be accepted in the absence of those of the principal. Bearing in mind, however, the importance

in pharmacy of the influence of the personal guarantee, and that this influence becomes weaker and weaker the more it is stretched, the distribution of drugs should, obviously, in the interests of the public and of pharmacy itself be confined, as a rule, to those who can afford such a personal guarantee—to those who, let me reiterate, either compound or test every drug they distribute. In the matter of pharmacy a State will, year by year, be better and better served to the extent to which there obtains a pharmaceutical policy that provides for the growth, not of those already named as mere distributors of drugs, but of druggists who are manufacturers and distributors too.

The third-named agent of drug distribution, the medical practitioner, cannot be, and probably never desires to be, a competent pharmacist. He has never professed to be anything more than a distributor of drugs, and as year by year the demands upon his medical, surgical, and sanitary skill become, as they do, greater and greater, he will probably find his pecuniary interests, his tastes, and his aspirations for social position, prompting him to relinquish drug distribution altogether. Let pharmacists take care previously to prepare themselves for the work that will then fall into their hands; for whatever be the period when such a state of things comes to pass, it will be the outcome of a public demand for more and better work all round, from the pharmaceutical as well as from the medical practitioner; nay, the period of the demand will be greatly accelerated by the promise and power of the potential supply. Doubtless the country doctor will always carry, or hold himself ready to carry, in his pocket, his saddle-bag, or his carriage, agents which heal as well as agents which hurt, agents to inject into the flesh as well as those with which it may be incised, agents in the form of the soothing pill or the stimulating spirit. But for the compounding of even these he will look to the pharmacist proper, who with due and dignified responsibility will be near at hand to supply fresh and trustworthy fluids, convenient combinations, and palatable preparations, and who will receive adequate but not extravagant remuneration.

Respecting the distribution of drugs by retail vendors other than competent and trustworthy druggists, it is open to very serious question whether a State does not get more harm than good by such a practice. Such vendors can offer no personal guarantee either of the purity or the efficiency of their drugs. The practice may perhaps be tolerated for a time in a country where the machinery for the supply of druggists who are compounders as well as dis-

tributors is incomplete. But in a State in which all the druggists are competent for their work, the supply of medicinal agents by vendors other than druggists should only be permitted in districts where population is below a given number per square mile, and then only in unbroken packets supplied by a not far-distant registered and responsible pharmacist. With non-pharmaceutical vendors of drugs must be classed co-operative stores. For personal responsibility respecting either raw or compounded drugs is scarcely compatible with the co-operative system. The companies who own co-operative stores do not make their own drug compounds. They are mere distributors. They could not well do or be anything else. At first sight it would appear that such an undesirable condition of things for the welfare of the public might be remedied by the employment at such stores of a staff of properly qualified pharmacists; men who could not only discriminate between good and bad raw drugs, but who could and would test all supplied drugs admitting of assay, and who could guarantee the quality of all other preparations because they had made them. There is, however, a good reason why such a remedy could not work, for then the cost of, and hence the prices charged for, dispensing prescriptions would necessarily be pretty much those of ordinary retail shops, and the inducement for the public to deal at stores rather than at shops would cease. Besides, long before such a remedy can be applied, society will probably find that money saved at co-operative stores, having to be expended in those rates and taxes, and in those many services now paid for by shopkeepers, there will be a balance of State advantages in leaving trade to the trader, and certainly in leaving the half-trade, half-profession of pharmacy to the pharmacist.

Respecting the distribution of drugs in the form of proprietary preparations, especially those called patent medicines. The question here must be not so much what improvements can be effected in this mode of distributing drugs to the inhabitants of a country, as, cannot the inexorable demand for simple medicinal remedies by the public be supplied in a better form than that of patent medicines. For the demand for simple remedies by all persons, and the habit of prescribing simple remedies by all persons for themselves, or, for one another, are matters which always have lain outside, and always will lie outside, medical practice by professional men, a demand and a habit the source of which lies deep down among the springs of human nature, and of the common sense of free people. They therefore scarcely admit of criticism, and do not admit of carping,

cavilling objection. The demand and the habit exist naturally in this country, and must be dealt with wisely. They scarcely admit even of definition, or of the drawing of any line up to which they may go, and beyond which they may not go. This much would seem certain, however, that if a mother for a child or a friend for a friend may prescribe a remedy which has proved serviceable under similar circumstances, surely a druggist, who is daily dealing with remedies from year's end to year's end, may prescribe simple remedies too. If one druggist will not do so, we may be quite sure another will; and that to the extent to which druggists generally do not prescribe simple remedies, to that extent patent medicine owners will step in and far less usefully supply the irresistible demand. Some medical men decry the habit of prescribing by druggists; but is the demand for simple remedies by channels other than the medical man's prescription thereby curtailed? Probably not. On the other hand, do not such medical men, and those druggists who from various motives follow the medical lead, thereby play directly into the hands of the proprietors of patent medicines? In the United States the practice of medicine is largely separated, and most wisely separated, from the practice of pharmacy. But besides this, the open recommendation of simple remedies by druggists is discouraged. With what result? In no country is traffic in secret remedies more rife. It is of course wrong for the pharmacist to meddle with pathology, attempting to diagnose while knowing nothing about the human frame. I trust no one will construe what I have said into support of quackery. But whenever and wherever a druggist is free to sell a patent medicine, he surely should be free to sell and be able to sell a simple remedy prepared by himself, by the aid of that special pharmaceutical knowledge and skill which are the guarantee that he is something more than a mere drug distributor. The inability to recommend remedies characteristic of the mere seller of drugs, and the professional jealousy which would stop a qualified pharmacist from recommending them, have probably done more to foster the present enormous demand for secret remedies than all other causes put together. The reduction of what is sometimes termed the patent medicine evil will probably be effected, chiefly, by that gradual extension of pharmaceutical knowledge amongst our future pharmacists, which will enable them to supply from their own shelves simple remedies for those tiresome minor maladies for which the public are now driven to patent medicines. The druggist who in this country prescribes simple remedies is a man

who has been called into existence by the wants of the community; a useful servant, whom the public are too mindful of their interests ever to discharge. Society distinguishes clearly enough for all practical purposes between this man and the medical practitioner, and well may be left to seek the aid of one or other as required.

For improvement in drug distribution, therefore, we may reasonably look in two directions. First, in the distribution of drugs being limited, in the main, sooner or later, and of course without injuring any one, to druggists, such druggists compounding as well as distributing most of the drugs with which they deal. This will be brought about internally by education, externally by legislation. Internally by the carrying out of that policy to which pharmacists may now be said to be committed, and which may be summed up in the words sound and thorough compulsory pharmaceutical education; externally by appropriate legislative enactments. Improvement will result, secondly, in our having in the place of secret remedies, which are prescribed by persons at a distance, who are irresponsible, the open recommendation of simple remedies by pharmacists who have made the components themselves, and who can guarantee their trustworthiness. This too will be brought about gradually by improved pharmaceutical education, and by that only. It would be unwise to provide for pharmacists any modified medical education. Let there be no pretence of professional medical treatment mixed up with pharmacy. Let the druggist's recommendation of simple remedies be founded on that knowledge and experience which comes of much pharmaceutical familiarity with remedies, and on that common sense and perception in all that pertains to drugs, with which a properly and specially educated pharmacist may be credited. Indeed, any trespassing on the purely medical domain would necessarily sooner or later involve commensurate punishment.

Pharmaceutical Legislation. The old partnership of Chemists and Druggists. Pharmaceutical Organization.—A few words must be added on each of these subjects.

Legislation.—As regards enactments that will enable pharmacy better to perform her duties to the State, they must be of two kinds—each complementary to the other. First, those designed for the well-being of the public; second, those which provide for the well-being of the pharmacist. It is to the interest both of the public and the druggist that the sale of poisons should be restricted, it is to the interest of both that the sale of compounded drugs should be restricted. For a State to assert that druggists must be qualified

is only, in other words, to proclaim that drugs should not be sold by unqualified persons: the one proposition is involved in the other. It is law that the British druggist must be qualified. The health and welfare of the community has called this law into existence. Why? Because the health and welfare of the community are endangered if this dealer in drugs is not qualified. To this end the law has labelled him alone "Chemist and Druggist." From this point of view a Pharmacy Act which provides for the qualification of drug vendors without rendering penal the vending of drugs by unqualified persons is simply incomplete. It is no answer to this argument to say that the State, by protecting the title "Chemist and Druggist," has only adopted means for the proper supply of drugs to those of the public who cannot judge for themselves, and who desire State guidance, and that to go farther than this would be to interfere with freedom. *Caveat emptor* does not apply here, however good the judgment for other things may be. For no ordinary purchaser is able to judge of drugs. It is too bad to expect him even to judge of the qualifications of the vendor solely by the presence or absence of the words "Chemist and Druggist" in connection with the shop, for the time-honoured coloured show-bottle and a display of senna, rhubarb, etc., forms the commoner test. To provide for the well-being of the public who cannot judge of drugs for themselves something more than the test of title should be allowed. But in truth no such indirect mode of providing the public with qualified druggists will suffice for the public welfare. The only way in which the welfare of the public, so far as it is affected by drugs, can be provided for, and harm to the public, as far as it may come from drugs, be provided against, is not only to enact that druggists must be qualified, but that drugs must not be sold by unqualified persons. This is already enacted for a certain small number of drugs named in a Schedule to the Pharmacy Act of 1868, and deemed poisons. So far so good. But all drugs are, more or less, poisons. The sale of all drugs should be thus restricted. If there are any substances sometimes used as drugs, but so harmless, and so generally used for other purposes, that to restrict their sale would be inconvenient to the public, let such drugs alone be scheduled as those which may be sold by unqualified persons. A Pharmacy Act which provides for the qualification of vendors of drugs, but contains no clause preventing the sale of drugs by unqualified persons, is incomplete. And if our own Pharmacy Acts are thus incomplete, the sooner they are rendered complete by an extended Pharmacy Act, the better for the

State, the pharmacist, and the public. To get our legislature to take an interest in this matter, and to view it in its proper bearings, should be the only difficulty in the way of obtaining legislative enactments which will better enable British pharmacy to perform her duties to the State. This is no mere matter of class legislation, but a subject of considerable national importance. Let us only take care that the thoroughness of our pharmaceutical education fully demands or warrants such legislation, which it will do when founded not alone on that very inefficient test termed "a pass examination," but also on a properly arranged public curriculum diligently followed for an appropriate period.

Chemists and Druggists.—An address on the relation of pharmacy to the State should include, at all events in Great Britain, some allusion to that part of the implied duty of a pharmacist to his country covered by his use of the designation or title of "Chemist." The English pharmacist is a "Chemist and Druggist." From what has already been stated, it will be clear that the proper standard as regards such a "Chemist," is that of a man who is not only a vendor of chemical substances, but who has sufficient professional knowledge of chemistry to enable him to guarantee analytically every one of his drugs and chemical substances that admits of chemical assay. And there are large numbers of pharmacists in this country who can do all this and more. But does the average chemist and druggist of to-day come up to this standard? Is he even a general trading *chemist*? Is he not rather a man who has left to the oilman and the grocer the vending of "soda" and other alkalies, vinegar and other acids, delicate mineral and vegetable dyes and colouring matters, and hosts of such "chemicals," as they are termed; a man who, while calling himself and legally appropriating to himself the title of "chemist," has, through his ignorance of chemical substances, allowed chemists, who dare not call themselves chemists, to establish shops for the sale of photographic and other chemicals, and chemical and physical apparatus generally; a man who, through being unable to perform such simple chemical operations as the testing of a fluid excretion for albumen or sugar, has driven from his doors the prescription-bearing patient afflicted with diseases of the albumenoid or saccharoid type; and a man who has committed these sins of omission, not always because his time was wholly occupied with the pursuit of pure pharmacy. Can such "Chemists and Druggists" wonder that their calling is declining in this country, when even for chemical guarantees of the genuineness of their goods they must rely on the distant

wholesale manufacturer, and for the pharmaceutical attractiveness of prettily coated pills, they find it necessary to go to the other side of the Atlantic? Will the rising generation of pharmacists allow this state of things to continue? No doubt a great deal of the work of the pharmacist of fifty or one hundred years ago has gone never to return, but a vast amount of new work has taken the place of the old. Chemistry is progressing with a rapidity unexampled in the annals of man's avocations. The trade in the materials and apparatus for the study and the practice of chemistry by amateurs, professional men, and manufacturers, is extending year by year. Will trading "chemists" allow this chemist's trade to slip through their hands? At no previous period in the history of this country has the subject of purity of food, drink, drugs, and all other things, occupied so much attention as at present. Never was there a greater demand on the part of the public, not for direct analysis at the request of ordinary purchasers by officials under the Acts relating to adulteration—that Parliamentary scheme (Act of 1875, Section 12) has entirely failed—but for the personal guarantees of vendors that articles sold are what they are professed to be. Who so well able to give this guarantee as the "Chemist and Druggist" who is a chemist as well as a druggist. Such a chemist will extend his trade over the whole commercial area of chemistry, as well as draw to himself those pharmaceutical streams now flowing in channels uncontrolled by pharmacists. There is also minor professional work to be done by the "chemist" in such directions as those already indicated; work chiefly qualitative, and for which the chemist and druggist would perhaps only receive silver fees, but for which he would be remunerated over and over again in the confidence reposed in him by his customers, and by the medical practitioners of the neighbourhood, and in the prestige and status it would win for him.

Organization.—A word respecting organization amongst pharmacists. Organization, in the absence of which any consideration of improvements in the modes of collecting, elaborating, or distributing drugs would be little more than a dream. Organization, without which the duties of chemists and druggists to the State will only be performed in an incomplete and haphazard manner, and without which their own interests will be developed or maintained very imperfectly if at all. Such organization—the work of a generation of philo-pharmaceutic pioneers—exists already in this country as regards about one-third of the chemists and druggists. Had the other two-thirds responded to the general appeals made by their brethren

more than once during the past forty odd years, it is safe to aver that not only would the State at this moment be better served by pharmacy, but every pharmacist would be richer in pocket, richer in social position, richer in self-respect. Even now, were the advantages of union and a pathway to union brought home to every pharmacist—which could be well done now that we have a complete Register—there can be little doubt that nearly every druggist having any really important stake in pharmacy would join in forming a Pharmaceutical Society of Great Britain co-extensive with British pharmacy. It would be astonishing, indeed, if after such a special appeal any very large proportion of the druggists in the country were found to care so little for the welfare either of themselves or of the community, or to perceive that welfare so imperfectly, as to hold aloof from such an organization. But our chief hope must rest with our pupils and young men. Cannot some plan be carried out by which all future pharmacists shall become members of one great national society?

CONCLUSION.—In the course of this address on an aspect of pharmacy complementary to the political, an attempt has been made to set forth the duties of pharmacy to the State in obtaining, elaborating, and distributing drugs; suggestions have been offered by which pharmacy may better perform these duties; hopes thrown out respecting the duty of the State to pharmacy, though this more directly political question has only been glanced at; and for the thoroughly qualified chemists and druggists of Great Britain generally, a brighter future foreshadowed than might at first sight be anticipated. Amongst the body there are large numbers who can well hold their own with the pharmacists of any country in the world, whether as followers of pure pharmacy or as "chemists" as well as "druggists." All that these are now, the rising generation of pharmacists should strive to become. With a thoroughly united, thoroughly educated, body of pharmacists, in number properly proportionate to the population of the country, each pharmacist a unit in one great society of pharmacists, we may confidently predict for no very distant future a relationship between pharmacy and the State which shall be permanently beneficial to all concerned. We too

> " . . . rest in faith
> That man's perfection is the crowning flower,
> Toward which the urgent sap in life's great tree
> Is pressing,—seen in puny blossoms now,
> But in the world's great morrows to expand
> With broadest petal and with deepest glow."

Mr. CHIPPERFIELD said the gentlemen present had all listened with much attention and gratification to the eloquent address just given; an address eminently practical and full of interest both to pharmacists and the general public; and he would fain hope that at least some benefit to the general public might be the outcome of its publication. It had always seemed to him an anomaly and a glaring injustice, that while the pharmacist of the present day was bound to acquire an excellent education and to submit himself to a stringent examination, he had no legal safeguard and possessed no special privileges in carrying on his vocation. The mere scheduling of a certain number of poisons, and he alone having the right to vend them, was virtually no protection or benefit to him or to the public, and nothing more incontrovertible was ever uttered than the proposition that a Pharmacy Act which provided for the qualification of the legal vendors of drugs, but contained no clause preventing their sale by unqualified persons, was incomplete, it being lame and impotent in the extreme. The great difficulty to his mind hitherto had been to see how persons living in rural and sparsely populated places were to obtain the necessary medicines if only legally qualified pharmacists might vend them; but the suggestion make by the President that unqualified persons should be permitted to supply the consumer with such medicines only in sealed packets supplied by qualified pharmacists completely destroyed that difficulty. It was his pleasure and privilege to propose that a hearty vote of thanks be accorded to the President for his very admirable, eloquent, and practical address.

Mr. O. R. DAWSON had much pleasure in seconding the vote of thanks. He was quite sure the words uttered that morning would be read by all English-speaking pharmacists with a great deal of pleasure; he hoped that what the President had foreshadowed with regard to legislation would be embodied in the Pharmacy Bill which he hoped it would soon be the duty of the Council to introduce.

Dr. QUINLAN wished to say a few words in support of the motion. The address presented a great number of subjects which gave rise to a great deal of reflection, both on the part of the medical profession and also of the pharmacist, for he considered that the interests of these two great callings were inseparable. He had been much struck with the remarks about the collection of drugs, for nothing could be more unsatisfactory in many ways than the manner in which this was now conducted. In fact, it resembled the vicious system of merely asking a candidate what he knew,

without any reference to where he had been educated. At present they had to take drugs collected by anybody, and depend on the commercial conscience for their purity, and, with all due respect for that commercial conscience, he might say that any one who had occasion, as he had, to go through large samples and quantities of drugs, would be convinced of its extreme elasticity. He thought the suggestion made as to the establishment of pharmaceutical gardens was a very good one; they would require a good deal of trouble and skill to be brought to bear, but they would certainly pay. With regard to the practicability there could be no doubt; in the botanic gardens a great number of plants were grown on a small scale, and if a small bed of plants could be grown for the instruction of students, why should not two or three acres be cultivated? The greater certainly included the less. The distribution of drugs was a great difficulty. He had been convinced by long experience that there must be a hard and fast line of separation between the prescribing and compounding of drugs; he believed the two duties must be performed by two entirely distinct classes of persons. There was only one exception to that, and that was in thinly populated districts which would not support a pharmaceutical chemist; there the travelling physician or surgeon, who went, thirty, forty, or sixty miles a day, would have to carry about his own drugs, but there was nothing to prevent his getting them from a practical pharmaceutical chemist, who would be able to guarantee their purity either by manufacturing or testing them himself. With regard to the manufacture, there was no doubt that there were some substances which could not be made with economy, except on a large scale; but there was a day within the memory of living men, when the bulk of pharmacists made their own preparations. Those happy days, when concentrated infusions and such like things were entirely unknown, had gone, and he much wished they would return, and that pharmacists would make their own preparations with the exception of elaborate chemical compounds. He had listened with the deepest regret to the statement that nearly a million a year was spent on patent medicines. People were very fond of dosing themselves, and they would ask for these things; but, in his opinion, a great deal of the blame lay with doctors and chemists, who should endeavour to diffuse truer notions amongst the masses, for it could not be very difficult to persuade them that one article could not cure thirty or forty different complaints; and gradually he hoped they might be able to educate patent medicines off the face of the earth. In conclusion, he

alluded to the fact that the Royal University in Ireland required from all candidates for a medical or surgical degree a course of practical compounding and of pharmacy, and it required that this should take place in some regular pharmacy, not in a hospital or dispensary. He thought it extremely important that members of the Irish Pharmaceutical Society should see that they were not left out in the cold with regard to granting these certificates, which he considered they were as much entitled to do as the Irish apothecary. He believed the privilege could be obtained by simply asking for it.

Mr. HAMPSON wished to thank the President for his very able address, but he feared the hope he had thrown out of getting so much State aid was rather illusory; at all events they might hope, however, to have at some future day the dispensing of medicine protected by the State, and that would be a great step in advance. He must say he had more faith in the good results of educating the people themselves than in anything which was done by the State. When the public became more enlightened on these matters, it would go to the best men it could find in the trade or profession, and until that came about he feared there would not be any great change. In London he feared that instead of making any advance in the way of getting the dispensing of prescriptions, they were rather going backwards; the medical man seemed to look for his profit to the retailing of medicine and giving it in the cheapest possible form.

Mr. ATKINS wished to add his testimony to the value of the address. Professor Attfield had paid a high compliment to the Pharmaceutical Conference in preparing so thoughtful and admirable an address, and the highest compliment those present could pay it in return would be not to attempt to criticise it in detail, but rather to peruse it carefully, and form their conclusions upon it. It had been his privilege to listen to many presidential addresses, but he did not know that he had listened to one which appeared so suggestive and likely to evoke a very large amount of controversy. The very highest tribute which could be paid to it was that it would bring out the points of difference in the pharmaceutical world. The division of the subject was admirable—collection, preparation, and distribution were three points which could be at once fixed in the mind. He thought the suggestion of drug farms in this country a very happy one; it might be merely visionary, but he hoped it would prove to be practical, and that it would become practicable to produce on a large scale anything which the climate would

admit. He hardly agreed with Professor Attfield as to the necessity or desirability of every chemist making all his own preparations. He quite agreed with him that the knowledge requisite to do it ought to be there, but it seemed to him the tendency of the age was rather to produce the best article under the most perfect conditions, such as could only be attained in large manufactories, where there were the best appliances and the most complete division of labour. Still, he thoroughly agreed that the knowledge requisite to produce all these preparations ought to be possessed by pharmacists, and if they did not all possess it now, it should be their earnest aim that their sons and successors should possess it.

Professor TICHBORNE also desired to express the pleasure with which he had listened to the address, and remarked that the subject referred to by Dr. Quinlan had engaged the attention of the Council of the Irish Pharmaceutical Society at its last meeting, and measures were being taken to secure if possible that the education of the pharmacist in Ireland should be available for conferring the qualification in the compounding of drugs required of medical men.

The vote of thanks was then put by Mr. GROVES, and carried unanimously.

The PRESIDENT, in response, thanked the meeting for the resolution. He said he had endeavoured, in the words of his predecessor, to give a good, straight look at things as they were, and he had also endeavoured to give a common-sense view of things as they should be. What he had said he simply put forward as his own opinions, and he had been abundantly compensated for any trouble he had taken in preparing the address by the manner in which it had been received.

The reading of papers was then proceeded with. The first paper read was the following:—

FIRST REPORT ON THE DIFFERENCES BETWEEN THE ESSENTIAL OILS OF CINNAMON AND CASSIA.

BY A. H. JACKSON, B.SC., PH.C.

This investigation was begun in answer to a question on the Conference Blue List, and the work has been done in the Laboratories of the Owens College, Manchester.

The oils were distilled by Mr. Umney from carefully selected samples of barks:—100 lbs. of the bark of *Cinnamomum Zeylanicum* yielded nearly 8 ounces of the essential oil of cinnamon, and 200

lbs. of the bark, whose source is variously ascribed to the *Cassia lignea*, *Laurus cassia*, and *Cinnamomun aromaticum*, yielded nearly 16 ounces of the essential oil of cassia; thus the barks practically yielded $\frac{1}{2}$ per cent. of oil on distillation.

The aim in these experiments was to treat both oils in a similar way, in the hope of separating some product from the one that is either not contained in the other, or is contained in a different proportion, and as a physical examination only involved a very slight consumption of material, the oils were tested from both a physical and a chemical standpoint, although the Conference question only asks for a chemical distinction.

Physical Examination.

Effects on the Senses.—The oils had a pale-brown colour, distinctive and characteristic odours, sweet taste, the cinnamon being more fiery than the cassia.

Effects on Polarized Light.—Gladstone says the oil of cassia has no effect (*Journ. Chem. Soc.*, xvii., 3). The "Pharmacographia" puts cassia as 0·1° dextro-rotatory with a column 50 mm. long, and cinnamon as slightly lævo-rotatory; whilst Symes says that cassia has a lævo-rotatory power of 1° and cinnamon none, with a column 100 mm. long.

Relative Densities.—The density was calculated from the formula $\Delta = \frac{m}{w}(Q - \lambda) + \lambda$, where m = the apparent weight in air; Q = density of the water used; λ = density of the air, at the time of weighing, in relation to water at 4° C. as the unit; w = the apparent weight of a volume of water of density; Q equal to the volume of the body. 1st weighings at 17° C.:—Empty flask = 28·466 grams; flask of water = 93·251 grams; water = 64·785 grams; flask of cassia = 95·583 grams; cassia = 67·117 grams; flask of cinnamon = 93·889 grams; cinnamon = 65·423 grams. Therefore, cassia Δ = 1·0346; cinnamon Δ = 1·0086. 2nd weighings at 14° C.:—Empty flask = 28·466 grams; flask of water = 93·257 grams; water = 64·791 grams; flask of cassia = 95·819 grams; cassia = 67·353 grams; flask of cinnamon = 94·013 grams; cinnamon = 65·547 grams. Therefore cassia $\Delta = \frac{67·353}{64·791}$ (·9993 − ·0012) + ·0012 = 1·0387; cinnamon $\Delta = \frac{65·547}{64·791}$ (·9993 − ·0012) + ·0012 = 1·0109.

The mean of these two determinations fixes the density of cassia at 1·0366, and cinnamon at 1·0097 in vacuo and compared with water at its maximum density.

The published densities vary somewhat. Thus, that of cassia is put as 1·0297 at 15·5° C. (in Watts's Dictionary); as 1·059 at 11° C. (Watts's Supplement); as 1·066 ("Pharmacographia"); as 1·053 at 15·5° C. (Symes); whilst that of cinnamon is put as 1·035 ("Pharmacographia"); as 1·008 at 25° C. (Gmelin's "Chemistry"); 1·025 at 15·5° C. (Symes).

Their *Absorption Spectra* were tried with negative results.

Refractive Energy.—The angle (ϕ) of an empty, hollow, triangular prism, was determined by observing the distance through which it had to be rotated in order to see a ray of light reflected from both sides of the angle, which measured—1st reading, 57° 58′; 2nd reading, 58° 5′ 10″; mean, 58° 1′ 35″ = ϕ. The prism was then filled with the essential oils, and the minimum deviation (δ) of a ray of *Na* light measured:—

	Direct Reading.	Prism Reading.
1st experiment	1° 27′ 0″	319° 24′ 20″
2nd ,,	1° 25′ 20″	319° 25′ 40″
Mean	1° 26′ 10″	319° 25 0″

$360° - (319° 25' - 1° 26' 10'') = 42° 1' 10'' = \delta$ for cinnamon.

	Direct Reading.	Prism Reading.
1st experiment	1° 26′ 40″	317° 29′ 0″
2nd ,,	1° 26′ 0″	317° 28′ 0″
Mean	1° 26 20″	317° 28′ 30″

$360° - (317° 28' 30'' - 1° 26' 20'') = 43° 57\ 50'' = \delta$ for cassia.

The index of refraction (μ) was calculated from the formula

$$\mu = \frac{\sin \frac{1}{2}\,(\delta + \phi)}{\sin \frac{1}{2}\,(\phi)}.$$

$$\mu = \frac{\sin \frac{1}{2}\,(42° 1' 10'' + 58° 1' 35'')}{\sin \frac{1}{2}\,(58° 1' 35'')} = \frac{\sin 50° 1' 22\tfrac{1}{2}''}{\sin 29° 0' 47\tfrac{1}{2}''} = \frac{6424811}{4850110} = 1{\cdot}32446 \text{ for cinnamon.}$$

$$\mu = \frac{\sin \frac{1}{2}\,(43° 57' 50'' + 58° 1' 35'')}{\sin \frac{1}{2}\,(58° 1' 35'')} = \frac{\sin 50° 59' 42\tfrac{1}{2}''}{\sin 29° 0' 47\tfrac{1}{2}''} = \frac{6293863}{4850110} = 1{\cdot}29767 \text{ for cassia.}$$

The specific refractive energy was then equal to $\left(\frac{\mu - 1}{d}\right)$ where (d) is the density of the oils at 15·5° C., thus cinnamon $= \frac{1{\cdot}32446 - 1}{1{\cdot}0107} = {\cdot}32102$, and cassia $= \frac{1{\cdot}29767 - 1}{1{\cdot}0377} = {\cdot}28685$. This energy is said to be due to the contained cinnamaldehyde.

From these observations it may be inferred that neither the relative densities nor the refractive energies are sufficient guides in distinguishing mixtures of these oils.

Chemical Examination.

These oils consist chiefly of cinnamaldehyde, together with small quantities of cinnamic acid, resins, and unexamined hydrocarbons. The acid and resins are probably due to oxidation of the oil, as they increase in amount with age and exposure. Of the latter, Mulder has examined two, viz., the α-resin, fusible at 60° and soluble in cold alcohol; and the β-resin, fusible at 145°, soluble in hot alcohol, but sparingly so in cold. There is said to be an unexamined camphor in oil of cinnamon, and a stearoptene in oil of cassia ("Pharmacographia"). Rochleder and Hlasiwetz found in oil of cassia a crystalline deposit to which they gave the name of "benzhydrol," and the formula $C_{14}H_{15}O_{2\frac{1}{2}}$ (Wurtz's "Dictionary"). Bizio says that cinnamon becomes turbid at 20° from a deposition of camphor; and Margueron that it freezes several degrees below zero, and then melts at 5° (Gmelin's "Chemistry," vol. xiii.). In Gerhardt's edition of Liebig's "Chemistry," essence of canelle is said to solidify at − 5°, and to leave crystals at − 20°.

Fractional Distillation.—All temperatures measured with a centigrade thermometer. A portion of the the oil of cassia, being neutral but turbid, was added to some fused $CaCl_2$, and ether; then decanted and the ether distilled off, after which the temperature rose to 218° and half the oil came over, leaving a solid black residue. This distillate was separated into six parts by heating in a small retort:—

1st. Distilled under 220°, small portions of a yellow and a light brown liquid which do not mix.

2nd. Distilled about 225°, brown liquid.

3rd. Distilled at 242° to 244°, large portion of brown liquid.

4th. Distilled at 245°, pale yellow, about half the bulk of the brown, and more fragrant.

5th. Distilled about 250°, yellowish brown liquid, from which fragrant and acicular crystals separated out after some weeks.

6th. Distilled above 255°, small portion of dark brown liquid, Residue, a brownish black solid, from which white fumes arose on strongly heating, but nothing more came over.

Bertagnini's Method.—This was thought to be productive of a better result than the method of fractionation. So that a portion of the cassia was shaken, in small quantities at a time, with a saturated

solution of potassium bisulphite, whereby a white magma and a small lot of yellowish liquid separated out; this was filtered and washed with methylated spirit by the aid of a Bunsen pump; the residue on the filter, supposed to be a crystalline mass of cinnamaldehyde and potassium bisulphite, was put aside for further investigation. To the filtrate were added water and sodium chloride; a very small quantity of oil separated out and floated on the surface. The supernatant oil, removed by a separating funnel, was treated with fused potassium carbonate to remove water, then dissolved out by anhydrous ether; after evaporation of the ether there was left a clear, brown oil, smelling of sawdust and patchouli (30); a pipette, which had been first tried for the removal of supernatant oil, was washed with methylated spirit and then with strong sulphuric acid, whereby a brownish violet colour was developed.

Some of the oil of cinnamon was treated in the same way and with a similar result. Each oil yielded about three times its weight of the washed, damp, fresh, crystalline magma.

Sometimes the oils did not combine with the potassium bisulphite; and at other times so entirely combined as apparently to leave no yellow liquid (as if there were nothing but cinnamaldehyde present); some of the lots liquefied and apparently separated into their original state immediately after combination. These liquefied mixtures of cassia and bisulphite were put into a retort, with some water, and distilled by passing steam through it; a brown residue (1) was left.

To the distillate sodium chloride was added, and it was re-distilled; from the opalescent distillates a few drops of a yellow liquid separated, floating on the surface and smelling of oil of bitter almonds.

Residue (1).—On boiling some of this clear, brown, fragrant, thick solution with cupric sulphate and caustic soda, it became yellowish red and turbid; in a little time it separated into a yellowish brown liquid and a reddish brown residue, consisting of red cuprous oxide and an oily substance, which, on addition of water, formed a yellow, turbid solution smelling of benzyaldehyde; therefore No. 1 probably contains a glucoside or glucose.

As it is probable that the cinnamaldehyde is the only constituent of these oils which combines with the potassium bisulphite, it is in the filtrate from their magmas that the cause of difference between the oils is likely to be found. But, as the oils are said to consist almost entirely of the cinnamaldehyde, there is but a very small quantity of material, and that largely diluted, left for the investigation.

The PRESIDENT said pharmacists had long wanted to know something of the differences and the causes of the differences between the oils of cinnamon and of cassia, and the Committee had asked Mr. Jackson to endeavour to throw some light on the subject, and he would now propose a vote of thanks to him for the skill with which he had so far accomplished the work. Mr. Jackson had confirmed what had been previously observed, that the specific gravity of cinnamon oil was considerably below that of cassia, for although the specific gravities had been given very differently by different observers, still, taking them all, it was clear that the specific gravity of cassia was considerably above that of oil of cinnamon. The numbers Mr. Jackson had quoted were for cassia from 1066 to 1030, and for cinnamon from 1035 to 1008; but he himself found the specific gravity of oil of cassia was 1037, while that of cinnamon was 1010. There seemed to be no great difference in the refractive energy. Finally, Mr. Jackson said the chief cause of the difference would unfortunately be found in a material which was present in a very small proportion of both these oils, for each of them consisted largely of cinnamaldehyde. This was unfortunate, because, though they were anxious that gentlemen should work at such subjects as this, which required special skill and expensive materials, at the cost of the Conference, still there must be a limit, and if they were to spend £10 or so simply to get from one pound of oil only a very small quantity of the material, which then only *might* contain what caused the difference between the two oils, he feared their funds would be exhausted before they arrived at any very satisfactory conclusion.

The vote of thanks was carried unanimously.

The next paper read was—

ON THE ALKALOIDAL VALUE OF BELLADONNA PLANTS AT DIFFERENT PERIODS OF GROWTH.

BY A. W. GERRARD, F.C.S.

At last year's meeting of this Conference I presented my first report on belladonna, the main features of which demonstrated the relative atropine value of cultivated and wild plants. The wild variety was found to be richest in atropine, and, contrary to general opinion, the leaf in both varieties was found to be richer than the root.

In continuation, I have been able to examine this summer two specimens of the first year's growth of the plant; likewise the second year's growth at three periods of development, viz., before, during, and after flowering. The object as regards the second year's plant was to determine at what period it attains its maximum therapeutic value.

Immediately on receipt of the fresh plants, the leaves and roots were separated and well dried, the estimation of the atropine being completed in less than a month from the time of collection. This rapidity of manipulation was considered advisable, to avoid as much as possible the changes plants undergo by keeping.

In the present experiments the process by which the atropine has been estimated differs from that described in my first report, the method of extraction, however, has been the same; the difference is that I have employed a volumetric instead of a gravimetric method.

For this purpose, I titrate the ethereal alkaloidal residue with a centinormal sulphuric acid, 100 parts of which is made to exactly neutralize 1 part of pure atropine. The alkaloidal residue being but sparingly soluble in water, I dissolve it in alcohol and colour with litmus, so as to clearly indicate the critical point. This method I find both rapid and accurate; to test it, two samples of commercial atropine, and two made by myself from cultivated and wild plants, gave upon titration figures agreeing within 1 per cent. This result, whilst demonstrating the accuracy of the method, also shows that commercial atropine is a very pure substance.

The first year's plants examined were both uncultivated, one grown in Yorkshire on a chalk soil, the other in Sussex in leaf mould; none of these plants appeared to have flowered; they averaged 6 inches in height, and twenty of them yielded on drying 203 grains of leaf and 165 grains of root. These two varieties gave the following results:—

Atropine in 100 parts Wild Belladonna, First Year's Growth.

	Roots.	Leaves.
From chalk soil	·21	·23
From leaf mould	·09	·22

The only value of this experiment is to show that the plant in the first year of its growth contains about half the quantity of atropine present in older plants, and practically this is of little importance, as on account of its small growth it is never collected for the druggist's use. The result also helps to confirm what I

have stated in my previous paper, viz., that a chalky soil favours the formation of atropine.

Examination of Second Year's Plant.

The cultivated kind only was subjected to analysis. It was grown by Mr. Ransom, of Hitchin, and gathered in the months of May, June, and July, June being the month when it is usually collected for the druggist's use, and would be expected to have arrived at maturity. The plants I received averaged 3 feet in height. The May plant, though not fully developed, had the most luxuriant crop of leaves. On the June plants the flowers were abundant, but the leaves were small. The July plant was covered with unripe fruits and small leaves.

Atropine in 100 parts Cultivated Belladonna, Second Year's Growth.

When Collected.	Leaves.	Roots.
May	·25	·21
June	·36	·32
July	·34	·32

This result shows that the plant before flowering is not rich in active principles, but it appears that at the period of flowering the full development is reached and maintained into the fruiting season. Especially worthy of attention is the increase in the June yield of atropine, it being one-third more than obtained from the May plant. The experiment also shows a simultaneous development of root and leaf, and not the exhaustion of the former to strengthen the latter. The inference from this is that root and leaf should be gathered at the same period.

Throughout these experiments, as on former occasions, the leaves have uniformly yielded more atropine than the roots.

The President said this was a strictly pharmaceutical report, and considering the powerful effects of such alkaloids as atropine on the human system, any researches on such bodies were of extreme importance. He gathered that in speaking of atropine, Mr. Gerrard alluded to what he defined last year rather as a double alkaloid, for he then said he would not tie himself to the statement that the alkaloid he obtained was chemically pure atropine.

Mr. Gerrard said he used the term atropine in the general sense, as usually accepted.

Mr. NAYLOR asked if these results were to be considered as commensurate with those obtained last year, because one would rather suppose, inasmuch as he had employed a different method for estimating the total alkaloid, there would be some slight deviation. The process of manipulation was very much shortened, and therefore it was probable that by the former process there would be a greater amount of loss.

Mr. EKIN said this was of course only a preliminary report, and as he understood that Mr. Gerrard was going to continue the subject, he would ask him if he thought it worth while to examine further the accuracy of the sulphuric acid determination. It certainly had the merit of extreme simplicity, but it might be worth further investigation as to whether it really did indicate the amount of alkaloid. Mr. Gerrard had told them that what he understood by the name alkaloid, as generally received, was a mixture, and that of itself introduced a little uncertainty, but this would be much increased if there were any doubt thrown on the method of determination. In such a very delicate operation the indications of litmus would be hardly sufficiently delicate. He would suggest to Mr. Gerrard, if he continued this method of estimating the alkaloids, whether he would not find methyl orange, or some similar body, give much narrower indications than were possible with litmus. He hoped they would be careful in drawing deductions as to the difference in quality of plants grown on cultivated soil and in their natural state from so comparatively small a number of experiments.

Mr. MARTINDALE asked if the volumetric test by sulphuric acid would not reckon the uncrystallizable alkaloid as well as the crystallizable atropine, and thus lead to error. Some manufacturers found that a great deal of uncrystallizable alkaloid was produced.

Mr. PLOWMAN would be glad if Mr. Gerrard would explain exactly what he meant by saying that he used a centinormal solution, 100 parts of which would exactly neutralize 1 part of pure atropine. With reference to Mr. Naylor's remarks, it was only fair to notice that the gravimetric method, as described by Mr. Gerrard last year, would hardly be practicable for estimating the atropine capable of being obtained from 165 grains of belladonna root. Some modification was necessary to get any results at all.

Mr. HOLMES said it was interesting to note the statement that belladonna grown on chalky soil yielded more alkaloid than that grown on any other soil. He had seen the plant growing on calcareous and on non-calcareous soil, and he had found that when

growing on chalky or calcareous soil it was far more luxuriant, which might account for the presence of more alkaloid.

A vote of thanks having been passed to Mr. Gerrard for his paper,

Mr. GERRARD, in reply, said he spoke of the total alkaloids because there was some uncertainty whether the product obtained was one definite substance or not. There was this difference between the process now employed and the one he adopted last year, that there was not so much mechanical loss involved in the present process, because there were not so many operations in it. In working out long processes, involving several precipitations and recrystallizations, there must be a mechanical loss, and therefore the percentages now given would be somewhat higher than those given before. Nevertheless, they were not very much so. The process he followed before was to obtain the alkaloid in as pure a state as possible, and to weigh it as alkaloid; and to do that, he ensured the thorough exhaustion of the mother-liquor of atropine, endeavouring as far as possible to avoid mechanical loss. In reply to Mr. Ekin, who doubted whether the residue he obtained would be all alkaloid, he might say that the residue was not all alkaloid, but it was not all neutralized by sulphuric acid. All which was neutralized by the sulphuric acid he assumed to be alkaloid, and he believed it to be nothing else; because when ammonia was used to treat an extractive substance, it liberated merely alkaloidal hydrates, and the sulphuric acid simply took them out together with colouring matters and some resins; but these latter would not neutralize sulphuric acid, therefore he had a right to assume that what the sulphuric acid neutralized was alkaloid. Mr. Martindale had spoken of uncrystallizable substances, not atropine, in the alkaloidal residue. He had worked a good deal with alkaloids and on atropine, and he had always found what was usually called the uncrystallizable residue by further manipulation to be capable of crystallization, and if the sulphuric acid solution of his alkaloid was again precipitated, the alkaloid could be easily extracted by pure ether in a crystalline state.

An adjournment for luncheon then took place.

Upon resuming, the first paper read was—

A NEW STYPTIC OF INDIGENOUS GROWTH.

By Professor Quinlan, B.A., M.D., M.R.I.A., F.K.Q.C.P.,

Senior Physician to St. Vincent's Hospital, Dublin; Professor of Materia Medica and Therapeutics to the Catholic University, and Examiner in the same to the Royal University of Ireland.

The great advances of chemical and of physical science and their application to medical and surgical purposes have much enlarged the means available for the treatment of disease, and in few departments more than in those connected with pharmacy, which, partly owing to chemical research and partly to botanical discovery, have expanded into an important speciality in the hands of eminent special investigators. It is, however, hardly to be doubted that all this great progress is accompanied by a certain disadvantage in medicine and surgery, as well as in pharmacy. In the former we have at our disposal the microscope, chemical tests, and other means of precision, which are rapidly giving to several departments of the healing art somewhat of the aspect of exact science; but often we are disposed to lean too much upon those scientific aids and to neglect that minute observation of symptoms by which the old physicians, all unlearned in science, accomplished such wonders of diagnosis. Similarly, in pharmacy, the great advances made by our special inquirers cause us to look towards purely chemical remedies, and to overlook many of the valuable old simples which in their day were found so useful; and in discarding which we have (while getting rid of much rubbish) certainly sacrificed some really potent drugs. Many of them are safe, efficacious, and accessible; and I propose briefly to bring under your notice one of them, which in its day had a great reputation, but which in latter times has been quite forgotten, with which I accidentally came in contact, and on investigation found very useful.

About a twelvemonth ago I was paying a domestic visit to a rather primitive part of the country, and when walking through the fields was urgently requested by the family of a small cottager to come to the aid of a little child who was stated to be bleeding to death. I found that this young patient was suffering from croup, and that on his windpipe some leeches had been incautiously applied by the cottager's family. Every one knows the difficulty frequently found in stopping such hæmorrhage in infants; and it

is a maxim in such cases that leeches should always be applied in some position where pressure can be resorted to if necessary. In this case the least pressure caused the appearance of immediate suffocation; the child had become quite blanched, and being away from home and not on professional duty, I had no surgical appliances about me. I was having a search made for cobwebs and was about to heat a small piece of iron, when a neighbour came in with a large handful of leaves which he chewed and applied to the bleeding spot with immediate success. I recognised the leaves as those of the *Plantago lanceolata*, or ribbed grass; and a number of trials made in hospital and elsewhere satisfied me as to their hæmostatic power, either in the chewed form or in that of the dried leaves, applied to bleeding surfaces. Satisfied as to efficacy, my next effort was to examine whether the observation had been anticipated by others; and I found that while modern writers are silent upon the matter, it is referred to enthusiastically by their predecessors from Pliny down to old Culpepper, "Student in Physick and Astrology." Shakspere alludes to it on several occasions; for example, Romeo, speaking of a wounded shin, says—

> "Your plantain leaf is excellent for that" (*Act* i., *scene* 2);

and, again, in reference to a wounded head (in "Love's Labour's Lost")—

> "No salve, sir, but a plantain" (*Act* iii., *scene* 1).

Culpepper's "Herbal," p. 285, contains the following statement:—

"The juice of the plantain, clarified and drank for divers days together, stayeth all manner of fluxes, even womans courses when they flow too abundantly. It is good to stay spitting of blood, or the making of foul or bloody water, also too frequent bleeding of wounds."

I may further mention that the Gaelic name of the herb is equivalent to the words "healing plant."

The plantains constitute in themselves a small natural order, and are described in detail in Sowerby's "English Botany," vol. vii., pp. 166 to 175, both inclusive. This little order contains two genera, viz., the *Plantago*, which embraces five species; and the *Littorella*, to which we need not further allude. The two herbs which I found useful are the *Plantago lanceolata*, var. *vulgaris* (Sowerby, plate, 1164), and the *Plantago lanceolata*, var. *timbali* (Sowerby, plate, 1165), both of which are simply ribbed grass, and

to be met with in every meadow; in fact, as the great Roman naturalist, in lauding them, quaintly says, "trodden under every man's foot." After a careful series of experiments, I have arrived at the following preparations, which I here exhibit, and for the goodness of which it will be sufficient to say that they have been prepared by Dr. John Evans, State Apothecary and Chemist to the Queen and to the Prince of Wales, 49, Dawson Street, Dublin. They are :—

1. The dried leaves of both species. They are intended for external application, and their action is partly physiological and partly mechanical. In fact, it much resembles that of matico, and like it it is somewhat ribbed.

2. A species of external linctus, comprising the leaves pounded in a mortar, with glycerine added to preserve them. This is intended to imitate the chewed leaves, and to be available at a time of year when the green leaves might not be forthcoming.

3. The juice, with sufficient alcohol to prevent it spoiling. This is intended for internal use. It has a hot, astringent taste, but not disagreeable, and somewhat reminds one of that of the cardiac tincture of rhubarb.

4. The juice, with glycerine. This was designed for physiological experiment on the capillaries, so as to avoid the fallacy incidental to an alcoholized preparation, and for cases in which alcohol would be unsuitable.

5. The green extract. This is made in the ordinary way, first separating the chlorophyll, then eliminating the albumen, and finally reducing the juice and chlorophyll to the consistence of an extract. With this preparation I have not as yet obtained satisfactory results.

Chemically examined, the plantain juice is found not to be a tannin, and to be compatible with both the ferrous and ferric salts, the alkaloids, metallic salts, and the preparations of ergot. For obvious reasons in all the chemical and physiological experiments I employed the plantain juice pure, but its compatibility with well-known astringents and hæmostatics is, of course, an additional recommendation. The juice evaporated to dryness and incinerated yields an ash containing much phosphate and scarcely any carbonate. If the tail of a gold fish be placed in the field of the microscope at 400 × so as to well display the circulation, and if the juice be applied to the web, after a little the following remarkable effects are observed. The circulation in the larger vessels is not interfered with, but in the capillaries there is a tendency to

retardation, almost amounting to stasis. It is thus evident that the juice possesses hæmostatic properties, due to some vegetable principle which is not a member of the tannin series so common in the vegetable kingdom. It is probably to this principle that the hot astringent taste is due.

This would not be the place to enter into therapeutical details. I will, however, ask the indulgence of the Conference to permit me to say that I have constantly used tho leaves, and with the very best results, in cases of external hæmorrhage suitable to styptics. In cases of internal bleeding from the lungs, the kidneys, the bowels, and in menorrhagia, I have got fair results from large and repeated doses of the juice, either fresh or fortified with alcohol or glycerine.

I recommend with confidence this ancient and once well-known styptic, so safe, so accessible, and, as I have found, successful. Many valuable lives have been saved, in the absence of surgical appliances, by the impromptu tourniquet of a pocket-handkerchief tied round the bleeding limb and twisted with a stick. In like manner it can at least do no harm to furnish the practitioner in an emergency with a means of arresting capillary hæmorrhage, which, should regular medicaments be not forthcoming, can be obtained in the nearest field or rural path in any quantity, and by the most uninstructed persons.

The President, having proposed a vote of thanks to Professor Quinlan, said it would be interesting to know his opinion as to whether styptics acted chemically or physically, and if chemically, whether he thought it possible that one principle or more than one produced the action; if physically, as it would seem to act in the case of the tail of the fish, whether by exosmosis or endosmosis. He might not be able to give much information on these points at present, but from the skill with which he had treated this paper, it was to be hoped that he would continuo his researches on styptics, so that at some future time he might give the Conference a paper on the general cause of the action of styptics.

Professor Tichborne said there was no doubt that a great many of these old remedies had been sadly neglected of late years, and very good reasons had now been given why this one should be resuscitated, assuming it proved perfectly efficacious, because it was always at hand. He should like to ask how the succus was prepared, for he observed that it had a very dark colour, and the

question occurred to him whether a stone or an iron press or mortar had been used. He would also ask if Professor Quinlan had investigated it for substances allied to catechuic acid or catechu compounds, which did not, under ordinary circumstances, give the strong reactions with iron which were found with ordinary tannic or gallic acid.

Mr. GILES said he might mention, as germane to the subject, another indigenous plant of very common occurrence, which also had valuable properties, viz., *Scrophularia nodosa*, a plant which when applied to that troublesome malady, a boil, in its inflammatory stage, was more effectual in subduing the irritation than anything he had ever met with.

Mr. GERRARD asked if Professor Quinlan had experimented at all with this drug in cases of diarrhœa, to ascertain if it was a good internal astringent as well as external. The paper was interesting, as it added another to the list of astringents which acted as such without the presence of tannin. Professor Quinlan had spoken of the action of the glycerine extract on the capillaries, and of the care he took to avoid the use of alcohol, but he did not see much difference between the addition of ordinary alcohol and glycerine to the preparation, glycerine itself being an alcohol; it was a very powerful body; when applied locally, it abstracted water, and in the pure state acted as an irritant.

Mr. PLOWMAN said a styptic might act chemically, perhaps more particularly in favouring the coagulability of the blood, or it might act by causing contraction of the smaller blood vessels. In the experiment on the tail of the fish, Professor Quinlan did not say whether the smaller blood vessels were contracted or not, or whether the stasis or condition approaching stasis took place without any diminution in the calibre of those smaller vessels. In all probability if there were such an actual diminution in the calibre, the active principle in the styptic would act through the nervous system.

Mr. BROWNEN asked whether any experiments had been made to ascertain the effect of the chewed leaves as compared with whole ones; the process of mastication was the initiatory process of digestion, and might possibly set free the styptic agent existing in the leaves, or cause the development of something not present in the natural leaf. If it were so, it would facilitate the identification of the styptic body.

Mr. SCHACHT would like to ask one further question, though its solution would not bear on the power of the juice or of the

medicinal properties which were said to exist; but it might help to explain the first experiment which brought this matter under Professor Quinlan's attention, namely, the external application of the leaves in mass. Had Professor Quinlan in his microscopical examination directed attention to the leaf itself, to see whether or not it was covered with any special hairy processes which might serve the well-known purpose of distributing the blood over a large surface, and thus promoting its more speedy and complete coagulation.

Mr. POLLARD said it was desirable to be as precise as possible in the terms made use of, and it did not seem to him that the word linctus was quite appropriate in this case.

Professor QUINLAN said he quite admitted that, and should be glad of any suggestion as to a more suitable name.

Mr. SOUTHALL said that this interesting paper was very appropriate after the remarks in the President's address on the knowledge or want of knowledge possessed by chemists and druggists of our indigenous plants. If one looked at old herbals, the great bulk of the plants were said to possess the same properties, so that one could not gather much information from them; the same set of qualities were attributed to a large number of very different plants. The use of some of these old plants seemed to be now revived, for instance, parsley-piert (*Alchemilla arvensis*) and couch grass (*Triticum repens*) were not unfrequently used both by herbalists and in pharmacy.

Mr. BORLAND inquired if any investigation had been made as to the season at which these leaves were collected. Attention had already been drawn to the very proper point that regard should be paid to the period at which the collection of the articles of the materia medica was made. He might add that the *Plantago lanceolata* had long been used as a styptic in the part of Scotland from which he came, applied to cut wounds. Farm servants, when they met with an accident, would take one of the long leaves and bind it round the part; but the argument advanced in support of its medicinal action was solely a mechanical one, and he was not aware until now that it was supposed to possess any other property than that of acting as a covering to the wound. He should like to know if the plant was believed to possess these medicinal properties at all seasons of the year when it was found.

PROFESSOR QUINLAN said that he was much obliged to the Conference for the interest taken in his paper. It appeared to him that the action of the plantain leaf was partly mechanical and

partly physiological or vital. Upon the nature of the chemical principle he was not yet clear. With regard to Mr. Schacht's question, an ordinary pocket lens would demonstrate that the leaf was covered with a long hairy down, which must mechanically cause blood coagulation, on the same principle as matico. In reply to Professor Tichborne, he said that the leaf did not contain catechuic acid or any catechu compound that he could discover. The dark colour was due to the chlorophyll and not to any iron discoloration; in fact, the soluble salts of iron, whether ferrous or ferric, produced not the least discoloration when brought in contact with the juice. The interesting remarks of Mr. Giles, Mr. Southall, and Mr. Borland confirmed him in the belief that in throwing overboard almost the entire of the old simples, we had, among much rubbish, rejected many useful remedies. Several of these he had under investigation, and trusted to bring under their notice on a future occasion. He would also keep in view the President's excellent suggestion as to an investigation into the general action of styptics. That very morning he had heard from a member of the Conference a remarkable example of one of the old simples, which had proved immediately efficacious in the cure of some children suffering from chronic whooping cough, one of the most troublesome maladies with which the physician had to deal, and which was almost impossible to cure except by change of air. He should make it his business to look up this local herb, ascertain its scientific name, and investigate its properties. He had not tried the plantago in cases of diarrhœa, but simply as a styptic. In reply to Mr. Gerrard, he said that glycerine was of course an alcohol; but, as a matter of practice, it could be often used where the employment of ethylic alcohol was not advisable. In answer to Mr. Borland, he further mentioned that the specimens of plantain exhibited had been gathered in May and June, when the herb was at its best; he had no doubt, however, that at any time that it could be found in a fresh state, it would act.

A paper was then read entitled—

SOME EXPERIMENTS ON ENGLISH OIL OF LAVENDER.

By W. A. Shenstone.

Oil of lavender has been the subject of several researches, most of which have been undertaken by foreign chemists, the following

being among the chief statements that have been made concerning it :—

1. That it sometimes deposits camphor in cold weather, and that the camphor is identical with common camphor. Most of the experimenters who have obtained càmphor from this oil, however, have probably done so after the application of some oxidizing process; further, Messrs. Flückiger and Hanbury state in "Pharmacographia" that they have not been able to ascertain the above fact, and after some experience in the manufacture of the oil, and a good deal of observation during the last ten years, I also have been unable to obtain any confirmation of the first part of this statement, so that I think it is probably erroneous.

2. That it contains a hydrocarbon, isomeric with that from turpentine oil, which is said by Lallemand to boil at so high a temperature as 200° C. to 210° C., and which does not yield a crystalline hydrochloride. It will be seen in the sequel that recent experiments do not confirm these statements concerning the properties of the hydrocarbon in lavender oil.

The most recent contribution to the subject is that of M. Bruylants, an account of which appears in the *Journal de Pharmacie et de Chimie* for 1879.

M. Bruylants, working with pure oil of French lavender flowers, has obtained from it, by fractional distillation to the amount of 25 per cent., a product which after rectification over sodium he recognised as a terpene by its boiling point, 162° C., its vapour density and its action with iodine. When strongly cooled and treated with hydrochloric acid gas, it yielded a solid hydrochloride. He also believes the oil contains, to the extent of 65 per cent., a mixture of borneol and camphor, being led to this conclusion by the facts that determinations of carbon and hydrogen give numbers which are consistent with such an hypothesis; that after treatment with a mixture of potassium bichromate and dilute sulphuric acid it yielded camphor, and after treatment with phosphorus pentoxide he obtained a mixture of a terpene and cymene. The former in greater proportion, however.

As M. Bruylants was unable to separate any solid constituent by applying to the mixture a temperature of −25° C., and as there are many cases in which the solid constituents of similar oils are separated quite easily by cooling, I am inclined to doubt their presence in this case, especially as M. Bruylants' results are consistent with other explanations. Cymene is not unknown as an apparent constituent of essential oils, so that its isolation by the above method is

hardly a sufficient indication of the presence of camphor. And again, since bodies having the same composition as camphor have been obtained by the action of oxidizing agents on several substances, its isolation under these circumstances rather suggests that the above constituent consists of one or more liquid oxygenated bodies which yield camphor when treated with oxidizing agents, and that French lavender oil is in the main a mixture of these and of the above described terpene.

About six years ago Dr. Tilden was kind enough to put into my hands a considerable quantity of fine English oil of lavender, and I devoted a good deal of time to its examination. My results are by no means complete, as, unfortunately, all my material was destroyed in a fire which occurred at Exeter in 1878, and I have been deterred from returning to the subject since by pressure of other engagements, and by the very high price of the material. Probably I should not have brought them before the Conference now, had not the experiments of M. Bruylants on French oil seemed to me to give an interest to my incomplete work, which by itself it hardly possesses.

The quantity of material with which I experimented was rather more than 850 cubic centimetres. When distilled, about one-third came over below 185° C., and one-half of the remainder between 185° C. and 207° C. The distillation was stopped at this stage, as there was evidence of decomposition. An aqueous liquid, acid to litmus, came over with the distillates. The residue in the retort was finally distilled in a current of carbon dioxide, keeping the temperature low, in order to lose as little of the volatile constituents as possible. The portion distilling below 185° C. was again distilled, ebullition began at about 176° C., and nearly half came over below 180° C. The various portions which distilled above 180° C. were fractionated so as to get as much as possible of the lower boiling product, which was added to the above. During these operations there was constant separation of water, and I may here observe that this occurred throughout my work; portions which had been heated for weeks with metallic sodium still yielding traces of moisture when subsequently distilled.

The result of these operations was that I had a product boiling at 176° C. to 180° C., amounting to nearly one-third of the oil taken, about the same quantity boiling from 200° C. to 207° C., 140 c.c. boiling a few degrees above 180° C., and a black resin amounting to about 25 per cent. of the substance operated on. There is no doubt from the results of a distillation *in vacuo*, subsequently described, that this last was to a great extent a product of decomposition.

The portion which boiled below 180° C. was digested for many days with large excess of metallic sodium, the liquid being from time to time distilled off from a brown solid which separated, steam distillation being employed when necessary, to avoid the application of excessive heat. The product was fractionated and the portion which then came over at 170° to 175° C. was subjected to further prolonged treatment with sodium to destroy oxygenated compounds, and finally yielded a liquid which distilled at 167° to 169° C. The quantity of this substance was less than 1 per cent. of the oil taken, and as I could not hope to further purify so small a quantity, I decided to examine it.

I had no apparatus for organic analysis at the time, and by Dr. Tilden's kind consent, Dr. G. H. Morris made some analyses of it for me. He found that it contained about 3 per cent. of oxygen, but had a vapour density nearly corresponding to that of a terpene of formula $C_{10}H_{16}$. I myself examined the very small quantity which remained from his experiments, and found that the substance was a colourless oil with a camphoraceous fragrant odour, but not that of lavender oil. When well cooled with ice and salt, and saturated with hydrochloric acid gas, it yielded white needle-like crystals of a hydrochloride, which I collected and dried by pressing between filter paper. I was, however, unable to examine or preserve them, as the quantity was too small for purification, and in their then impure state they quickly melted at ordinary temperatures, and so disappeared. When treated with hydrochloric acid, and subsequently with ferric chloride, the oil behaved like a terpene. These results seem to indicate that it was a terpene, but still contained a little of the higher boiling constituents of the oil.*

Unfortunately my examination of the higher boiling fractions was hardly begun before it was brought to a close by the fire previously alluded to. In the course of the separation of the small quantity of terpene, however, I observed that under the action of heat they were modified with the production of water and with an increase of boiling point. In an experiment to test this point, I found that a portion of the oil, which boiled at 184° C., after heating for two hours and a quarter, with an inverted condenser, had its boiling point raised to 192° C., but that subsequent heating had not much effect upon it.† As regards the composition of this part of the oil,

* It is not, of course, certain that this substance had not been produced from other constituents of the oil during distillation. Its resemblance to the terpene obtained by M. Bruylants, however, inclines me to the belief that it was not so.

† Professor Letts, who has very kindly shown me some unpublished notes of

it appears to be highly oxygenated. Dr. Morris has made an analysis of a fraction boiling at about 200° C., and he found that it yielded only 83·6 per cent. of carbon and hydrogen, from which it appears to contain about 16 per cent. of oxygen.

I had also fortunately made the following experiments with the view of obtaining, if possible, any solid constituents the oil might contain :—

1. A portion of lavender oil was placed in a distilling flask sealed to a receiver, the arrangement was exhausted by a Sprengel pump till the pressure in the apparatus was equivalent to less than one inch of mercury, and then hermetically closed. The receiver was well cooled and the oil distilled at as low a temperature as possible until only one-fourth remained; the residue had the consistence of a syrup, and was of a pale colour, but gave no sign of crystallizing after standing for a month, nor did it do so on cooling by means of freezing mixtures.

2. Small portions of the oil of lavender and of one of the higher boiling fractions were cooled with a mixture of solid carbon dioxide and ether. They become exceedingly viscid, but gave no signs of crystallizing, even when minute fragments of camphor were added to them. It is difficult to believe, after these experiments, that the oil contains any notable quantity of crystalline constituents.

From the independent experiments of M. Bruylants and myself, it seems that the English and foreign oils differ very decidedly in the amounts of terpene they contain; that in each case it is a terpene yielding a crystallizable hydrochloride which is present; and that probably neither of the oils contains much crystalline constituent, but that both, and this applies particularly to the English oil, are chiefly composed of one or more liquid oxygenated bodies, which there is reason to believe yield camphor on oxidation, and which appear to undergo some degree of change during distillation. The statement in the books that lavender oil contains a hydrocarbon boiling at 200° to 210° C. is doubtless incorrect, as Dr. Morris's analysis shows that the distillate collected at near that temperature contains a large amount of oxygen. The further study of the oxygenated constituents will probably be most conveniently conducted with the English oil, as in that it is mixed with less hydrocarbon than in the foreign product.

In conclusion, I can only regret that I have not a more complete

experiments on lavender oil, has also observed this rise of boiling point under the influence of heat.

account of this matter to bring before the members of the Conference.

The PRESIDENT, having proposed a vote of thanks to Mr. Shenstone, which was carried unanimously.

Mr. JACKSON asked if Mr. Shenstone had examined the optical properties of the terpene from French and English oils before assuming that they were the same.

Mr. SHENSTONE said he did not assume that they were the same. He had not examined the optical properties, though he had intended doing so, because his material was unfortunately destroyed before he arrived at that stage.

The next paper read was on—

TERPIN HYDRATE: ITS PREPARATION AND CRYSTALLOGRAPHY.

BY R. H. PARKER.

This subject was brought under my notice by a sample of crystals of unknown composition, many of them remarkably well formed, found by my friend, Mr. W. Adams, of Shrewsbury, in a jar of "Furniture Oil," some of which had been sent to a customer who complained that it scratched the furniture; another bottle, carefully strained, was sent out, but it also came back in about a month, with a note stating that it contained "bits of glass." The stock jar on examination was found to contain a considerable quantity of the crystals in question. The exact formula from which the furniture oil was made could not be referred to with certainty; it was probably made from one consisting chiefly of linseed oil, turpentine, butter of antimony, and methylated spirit. A sample made according to this formula, however, has given no crystals during four years.

An examination of the substance proved it to be entirely volatile, and its elementary composition was soon found to be limited to C, H, and O. When searching for nitrogen by heating with soda-lime, the production of a highly aromatic camphoraceous odour was observed. Further information as to the nature of the substance was sought by ultimate analysis. Several well-formed colourless crystals, evidently very pure, were selected, carefully wiped, and powdered. ·1878 gram gave ·1995 H_2O and ·4375 CO_2; ·1787 gave ·1897 H_2O and ·4163 CO_2. Having observed its relation

to ordinary solvents, a search among bodies approaching this composition suggested that the substance in question was terpin hydrate. On comparison, a specimen of that substance was found to possess the same crystalline form and produced the same peculiar odour when heated with soda-lime. The percentage of carbon found was too high, probably due to the specimen not being absolutely pure. The following are the figures obtained:—

	1.	2.	$C_{10}H_{18}(OH)_2,H_2O$.
C.	63·53	63·53	63·16
H.	11·80	11·79	11·58

The attempt to produce the substance from the furniture oil having failed, the ordinary process was adopted, *i.e.*, a mixture of turpentine, nitric acid, and alcohol. Processes are recorded by Wiggers, Deville, Berthollet. Tilden, and others, giving different proportions of ingredients, and stating numerous conditions probably conducive to the formation of terpin hydrate, but neither details the exact method of mixing the ingredients or states what conditions really assist its formation.

Strong nitric acid, as is well-known, acts violently on turpentine and on alcohol, the products varying with the temperature and strength of the acid; the latter and the order of mixing are most important points to observe in the manufacture of terpin hydrate.

My first experiments were made with nitric acid, specific gravity 1·42; a mixture of five volumes of turpentine with two of methylated spirit was kept cool while two volumes of acid were stirred in; this was agitated occasionally for a few days, poured into a shallow dish and a little spirit added at intervals. A dark brown mixture resulted, separating into two layers, but no crystals appeared during many months.

In the next series the action of the acid on the turpentine was encouraged by floating the spirit on the oil, and pouring the acid through a funnel-tube to form a third layer at the bottom of the vessel, in this case the strong acid was in direct contact with the turpentine. The temperature rose rapidly, and an explosive ebullition took place, much vapour was disengaged, and the spirit afterwards boiled quietly for some time. A deep red syrupy liquid resulted, which showed no tendency to crystallize; it was very soluble in alcohol, the solution bearing considerable dilution with water.

The opposite line of action was next adopted, the acid was diluted with water and mixed with the spirit before adding the oil; this

proved to be the correct process, and crystals were invariably produced. Nitric acid of specific gravity 1·25 yielded most satisfactory results, when stronger than specific gravity 1·3 no terpin was formed.

Attention was now directed to the conditions most favourable to the production of crystals. Isolation did not appear to influence the result to any important extent. Crystals appeared sooner and in greater abundance in shallow than in deep layers of liquid; the depth should be about a centimetre. Slight occasional rotation of the vessel hastened the appearance of crystals.

The production of *colourless* crystals was favoured by the use of rectified in the place of methylated spirit, of freshly distilled turpentine in preference to that which has been long exposed to air, and by the exclusion of air from contact with the mixed ingredients. The latter condition was arrived at by placing a circle of glass, accurately fitting the vessel, so as to touch the surface of the liquid. The advantages gained by this precaution, and by the use of rectified spirit, were not sufficiently great to warrant their adoption in a manufacturing process. The exclusion of air seemed to favour the production of a larger proportion of crystals.

The following is the process finally adopted:—

Preparation of Terpin Hydrate.

Mix one volume of nitric acid, specific gravity 1·25, with one volume of methylated spirit, cool, place the mixture in a shallow glass dish and float upon it two volumes of oil of turpentine, rotate the vessel occasionally, and in three or four days crystals appear, allow to remain undisturbed for about fourteen days, collect the crystals on muslin, wash with cold water, drain and dry by exposure to air, re-crystallize, if necessary, from slightly diluted alcohol.

The two layers soon acquire a straw tint, the lower being darker, the colour gradually deepens and after a few weeks becomes deep red. The depth of colour is much less when contact with air is prevented. Most of the terpin hydrate is deposited in the first fortnight. The total produce does not often exceed one-third of the weight of the turpentine taken. When little or no more terpin is produced, the lower layer appears to consist of a mixture of nitric acid and alcohol saturated with terpin and containing a small proportion of the upper layer in solution; this floats when the mixture is diluted with water, whilst the terpin crystallizes out. The upper layer has a pleasant aromatic odour, decomposes on boiling, but in a

current of steam most of it passes over; the distillate being nearly colourless, while the residue is very dark red, thick, and heavier than water. The successive portions of distillate varied in specific gravity at 17° C. as follows :—

No. 1	0·896
No. 2	0·900
No. 3	0·910
No. 4	0·921

In odour, the last is similar to but more rank than the first, there is no resemblance either to that of terpinol or the original terpene.

In another experiment after the terpin had been deposited, the acid layer (*a*) and oily layer (*b*) were separated,

A fresh quantity of turpentine was floated on the acid layer (*a*) and an average crop of crystals was obtained; the upper layer was again replaced by fresh turpentine, from which also a large proportion of terpin was in due time produced.

The oily layer (*b*) was floated on a fresh mixture of acid and alcohol, but no crystals appeared for six weeks, and after that time, only a small quantity.

The results I have obtained agree, in the main, with Tilden's (*Journ Chem. Soc.*, 1878), except that I find the use of a weaker acid necessary, and omit the subsequent additions of methylated spirit.

The theory given by that author accounting for the production of terpin by the intermediate formation of a compound of terpinol with ethyl nitrate—

$$C_{10}H_{16} + C_2H_5OH + NO_2OH = C_{10}H_{18}O \left\{ \begin{matrix} OC_2H_5 \\ NO_2 \end{matrix} \right.$$

$$C_{10}H_{18}O \left\{ \begin{matrix} OC_2H_5 \\ NO_2 \end{matrix} \right. + 2H_2O = C_{10}H_{18} \left\{ \begin{matrix} OH \\ OH \end{matrix} \right. + C_2H_5OH + NO_2OH$$

—is satisfactory, except that it does not explain the fact that only one-third of the terpene is hydrated.

Crystallography of Terpin Hydrate.

The crystals which are first produced in the preparation of this substance are often extremely well formed, and if simply wiped, avoiding washing with water, the faces are remarkably brilliant. They consequently afford an excellent opportunity for the study of its crystalline form, which is a combination of the rhombic octahedron and prism, in which the faces of the former are dominant;

those of the latter are often much reduced, but never disappear. Fig. 1 illustrates the average form, which, however, is not often completely developed; the prism faces are frequently much extended, producing a more or less elongated prism, while they are sometimes reduced to quite a narrow face, forming a nearly closed octahedron. Fig. 2 illustrates the horizontal section. Occasionally the macrodiagonal edge (G and H, Fig. 2) is replaced by a narrow face, which is shown in Fig. 3, carried round the complete crystal. These faces are but slightly developed, and in the crystal as first formed they are seen on the pyramid in a few cases, and never on the prism. After recrystallization from alcohol, the macrodiagonal face may be

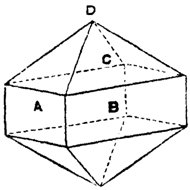

Fig. 1.

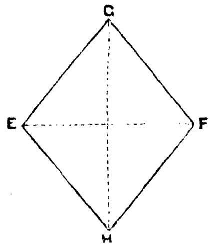

Fig. 2.

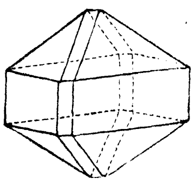
Fig. 3.

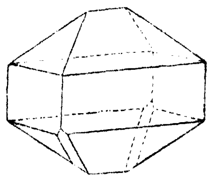
Fig. 4.

observed on the prism, more frequently on the pyramid, and occasionally on both.

The most important modification of form to which the crystal is subject consists in decrements from one or more faces of the prism and pyramid; in fact, nearly all are more or less modified in this way, the prism becoming more or less flattened, and the solid angle at the apex being reduced to a horizontal edge, forming a dome instead of a pyramid. Fig. 4, which illustrates these changes, and also the appearance of the macrodiagonal face on the lower side, may be taken as the typical form of terpin hydrate crystals. When produced from alcoholic solution, even slowly, the tendency is to form elongated prisms and needles, but the terminal pyramid is always evident. The brachydiagonal edge (E and F, Fig. 2) does not appear in any case replaced by a face.

The measurements of the opposite angles of prism and pyramid were found as expected, identical; the macrodiagonal face was found inclined equally to the adjacent faces of the prism.

After a large number of measurements, three of the most perfect and brilliant crystals were selected for final examination with the reflecting goniometer. Five different observations of the solid angle at the apex gave a mean 105° 6′; nine different observations of the inclination of the pyramid face to that of the prism gave a mean of 127° 33′; a slight error in excess is evident—

$$105^\circ\ 6' + 2\ (127^\circ\ 33') = 360^\circ\ 12';$$

a closer approximation would therefore be 105° 2′ and 127° 29′. Numerous observations of the prism faces gave as the best results—

Macrodiagonal angle E G F = 77° 45′
Brachydiagonal angle G E H = 102° 15′.

From these measurements the relative lengths of the axes are calculated—

E F	:	G H	:	vertical axis =
0·8007	:	1	:	0·4951.

This result, however, does not quite agree with the parameters given by previous observers (*vide Phil. Mag.*, 1879, p. 132) :—

Maskeleyne . . .	0·8082	:	1	:	0·4788
Arzruni	0·8072	:	1	:	0·4764.

Specific Gravity of Terpin Hydrate.

This appears to vary slightly, the average being 1·09, relative to distilled water at 17·5° C.

Solubility of Terpin Hydrate.

At 20° C. it requires for solution 13 parts of alcohol, specific gravity ·825; about 350 parts of distilled water; its solubility in alcohol is much increased by heat; boiling water dissolves about 3 per cent. It is slightly soluble in chloroform, carbon bisulphide, ether, and benzol; scarcely in turpentine.

This substance well illustrates the conventional character of the term solubility, which I have before pointed out when referring to that of salicin (*Pharm. Journ.* [3], xii., p. 378). A simultaneous series of experiments was made on the solubility of terpin in alcohol and in water, all being maintained at a constant temperature of

20° C. for over forty-eight hours. One part of terpin dissolved in 11 volumes of alcohol, with the aid of slight heat, did not crystallize; while 1 in 13, without heat, did not entirely dissolve, although repeatedly agitated. One part of terpin in 240 volumes of water, dissolved by heat, gave a single, tiny crystal at the end of forty-eight hours; while 1 in 300, without heat, left a considerable amount undissolved. The solubility cannot be taken by the method of evaporation, because terpin is volatile at a dry heat much below 100° C.

The odour observed on heating terpin with lime suggested distillation of such a mixture. Terpin mixed with four or five parts of lime was slowly distilled over a column of lime heated to low redness. A liquid yellowish oil was obtained, having a very powerful aromatic camphoraceous odour, in some degree resembling that of yarrow and cajeput, and yet distinct from them. Sometimes much terpin distils apparently unchanged, and solidifies in the condenser. I have not yet arrived at a process by which terpin can be completely converted into this oil, so as to obtain a sufficient quantity for complete examination. It seems, however, probable that terpin hydrate may be made to yield several aromatic oils by the action of dehydrating substances under suitable conditions.

The PRESIDENT said the first feeling on the part of most members on listening to this paper would be one of astonishment that so much science should be made to flow from a bottle of furniture polish; and the second would be that a great deal depended on who drew the cork. He was proud to think that in this instance it had been drawn by an old pupil of his own, and pharmacy should be proud to think that a gentleman engaged as an assistant behind a retail counter could find time and possess the ability to carry out an investigation of this kind. He would propose a vote of thanks to Mr. Parker, who he hoped would continue his researches.

A vote of thanks having been agreed to,

Mr. SHENSTONE said the most interesting point about this communication was the origin of the terpin in the bottle of furniture polish, which Mr. Parker seemed to think was a mixture of linseed oil, spirit of turpentine, and butter of antimony. There was a general impression that nothing answered very well for making terpin hydrate, excepting nitric acid diluted with alcohol, and now it seemed possible that further investigation might introduce a new body capable of producing terpin hydrate from turpentine, which would be interesting and important, as it might render the explanation of the reaction suggested by Dr. Tilden insufficient.

Professor TICHBORNE said it was his duty some years ago to prepare a considerable amount of terpin hydrate, when he discovered a body called colophonic hydrate, which in its properties bore a considerable resemblance to terpin hydrate, but it differed considerably in one important point, inasmuch as it gave a number of beautiful colour reactions with hydrochloric and sulphuric acid, which terpin hydrate did not. It was a product formed by oxidization from what was known as resin spirit, and there was no doubt a close relation between it and terpin hydrate. In preparing terpin hydrate, his experience was that if it were crystallized from fairly strong alcohol, a mass of fine crystals was obtained; but if a solution of 1 part of water to 2 of ordinary spirits of wine were allowed to evaporate spontaneously, very magnificent crystals were formed, sometimes approaching half an inch in length.

Mr. GILES asked how Mr. Parker arrived at the conclusion that the furniture oil had been composed of the ingredients he had mentioned. Was it by analysis or by communication of the formula?

Mr. PARKER said he was unable to arrive at the exact formula from which the polish was made; it occurred in a pharmacy where it was not frequently in demand, being made sometimes from one formula and sometimes from another; the one containing turpentine and butter of antimony seemed to him the most likely one; and he made some from that, but no terpin hydrate was formed. It seemed as if the formation of terpin hydrate required a peculiar condition in the mixture; whether a liquid isomer was formed he could not say, for the original sample which was sent out produced another crop of crystals within a month; whereas the specimen he made would not produce crystals under any conditions.

Mr. SHENSTONE asked if there was any possibility of the polish being made from a formula containing nitric acid.

Mr. PARKER said it was very unlikely; the preparation of furniture oil with turpentine and butter of antimony was very common, but he did not think any nitric acid would be used knowingly. Professor Tichborne's remarks on colophonic hydrate were interesting, but to his mind the production of beautiful crystals of terpin hydrate seemed due not so much to the solvent as to the presence of other bodies with it. In the first purification of these crystals by means of methylated spirit, the presence of the other bodies was very evident, and in that case only did he obtain a similar crystal. When recrystallized, either from rectified or proof spirit, he found the crystals always exhibited a tendency to assume the form of long prisms or needles.

The next paper read was—

ON A NEW METHOD OF MAKING A VOLUMETRIC SOLUTION FOR DETERMINING THE HARDNESS OF WATER.

By C. R. C. Tichborne, LL.D., F.I.C.,
Analyst to Co. Longford, etc.

It is rather curious to observe that in spite of our constant familiarity with the determination of the hardness in waters, we have never been able to improve, or modify, to any extent the original process of Dr. Clarke, invented nearly half a century ago. We may go even further, and state that we have never been able to throw doubt upon his original investigations, and that they stand as he left them. Any so-called modifications are merely nominal, and have been made to suit the modern centesimal mode of expression. The most important proposals have been made in connection with the making of the soap solution and the standard calcium solution used for titration. A few of these modifications are, without doubt, improvements; but none of them touch in the slightest degree the principle of the process. Thus, in making the soap solution, Dr. Clarke used a soap made from animal fats (curd soap), and it has been respectively proposed to use a soft soap made from olive oil, lead soap (*emp. plumbi*), or a soda soap of olive oil (Castile soap). All these last proposals are undoubtedly better than the original curd soap, as proposed by Dr. Clarke, owing to the very simple fact, that the fatty acids in the last three mainly consist of oleic acid, and that the oleates are less prone to separate in cold weather than the corresponding fatty bodies found in the curd soap.

As regards standard hard waters, I had adopted for some time the well-known modification of dissolving an equivalent quantity of powdered selenite. This process leaves nothing to be desired as regards the construction of a calcium solution. It is simple and gives most accurate results, providing there are no crystals of celestine in the selenite,—an experienced geologist will instantly detect them by his eye. It will be seen, however, further on, that the author proposes to dispense with the use of the calcium solution.

Having premised thus far, it might be asked, Why seek to change, or improve upon the process? Experience shows that the most troublesome part of the method consists in making the soap

solution. Soaps are too indefinite in composition to admit of making a reliable solution by merely weighing out a given quantity and dissolving it in a proper quantity of spirit. Assuming that a soap of a definite fatty acid could be always obtained, we find the amount of water to differ so considerably as to render a titration necessary; a titration, too, which presents some considerable trouble.

My first idea was that if we took oleic acid and neutralized it with a standard solution of sodium hydrate, the latter base would represent the calcium salts, constituting hardness, equivalent for equivalent. I found, however, in practice that this is not quite so simple a matter as it would appear at first sight, but at the same time it is quite easy to construct a soap solution upon the basis of the soda hydrate consumed by the fatty acid.

The quantivalence of oleic acid may be, and has been, variously viewed. It is generally viewed as a monobasic acid. As acid salts, however, are known, it may with equal propriety be classed as a bibasic acid; whilst, as will be seen further on, there is every reason to think that tetrabasic compounds of the alkalies exist.

Five cubic centimetres of commercial oleic acid were dissolved in 50 c.c. of spirit of wine, and 1 drop of a ·5 per cent. solution of phenol-phtalein added. A volumetric solution of soda was then run in until a pink indication was obtained. After repeating this experiment two or three times, the reaction was found to be not only well defined, but very constant. If litmus were used, not only is it difficult to determine the point of saturation, owing to the gradual transition of colours, but owing to the permanent dissociation of a trace of the oleates when in solution (to which the litmus is amenable), the reagent is not suitable to the experiments detailed. The 5 c.c. of oleic acid exactly worked off at 15·5 of the normal solution of soda of the British Pharmacopœia, which represents 0·62 gram of sodium hydrate. Theory for the oleate having the formula $M' C_{18} H_{33} O_2$ would require 0·6 of hydrate of sodium, assuming the 5 c.c. of acid weigh 4·575 grams.

At this stage of the experiments a curious observation was made when water was substituted for the alcohol. The 15·5 of volumetric solution when added, as I have previously stated, gave a permanent liquid product of a faint pink tinge, showing that the point of neutrality had just been passed. A drop more of the volumetric solution developed a magenta colour, which was permanent as long as the solution was left at this point of saturation. A further equivalent of sodium hydrate was then run in (viz., 15·5

c.c.), when it gradually became colourless again, and at 7·75 c.c. began to pectize; the solution at this stage represented about the consistency of thick mucilage. When the full equivalent was present the solution became a solid jelly. The vessel in which it was obtained might be inverted with impunity. The pectized oleates seem to be permanent and definite compounds. From their behaviour when thrown into alcohol they appear to be hydrated compounds and are perfect colloids. If we push the action further, other compounds are formed which are much more soluble. There seems to be a wonderful analogy between silicic and oleic acid, and the technical application of silicates in soap-making appears to have been one of those chance discoveries which are in advance of scientific knowledge. As I intended to reserve this part of the subject for a separate communication, I have only to consider on the present occasion the practical bearings of these observations.

The measurers of the hardness in water are really the fatty acids, and it is almost immaterial whether we use the monobasic or dibasic salt above mentioned. In these remarks, we retain the old formula of oleic acid, but it is evident that the whole subject requires revision. We find by experiment that very little difference will be obtained, but that as the pectized salt seems to lather more freely, and as the solution seems more permanent, I prefer it.* We, however, always depend upon the sharp reaction obtained on adding the soda until the pink solution is developed with phenol-phtalein. This point always represents the proportion of Na H O as equalling pure $C_{18}H_{34}O_2$.

The following is the process :—

As already mentioned, 5 c.c. of oleic acid are measured with a pipette and 50 c.c. spirit added to it in a beaker; 2 drops of phenol-phtalein solution are also added, and immediately a volumetric solution of soda $\left(\frac{\text{Na H O}}{1000}\right)$ is run in until a pink indication is produced. This must be done accurately, as the success of the process depends upon this measurement. If the gelatinous salt is required, another quantity of soda is then run in. The oleate of soda is then made up to the required measure by the addition of a mixture of equal parts of rectified spirit and distilled water. Each

* This remark is not strictly true. I have found specimens of some oleic acids which do not work well, and do not readily pectize, and wherever there is any doubt about the results, it is safer to merely add the exact proportion to neutralize the acid, as indicated by phenol-phtalein.

15·5 c.c. of soda used in the first saturation equals 820 c.c. of volumetric solution of soap.

Thus— $$\frac{n \times 820}{15 \cdot 5} = x$$

n being the number of c.c. of soda solution which the oleic acid works off at, it is to be made up x. Such a solution makes a lather exactly on the original scale of Clarke, and it becomes unnecessary to titrate such a solution against a calcium solution, the soda solution being quite as definite and reliable as a calcium solution. Again, although different oleic acids might differ in purity, such a condition of things introduces no error, as the volumetric soap solution is made up on the saturating power of the acid employed, this alone determines the strength. Oleic acid obtained from the candle manufacturers, and a pure sample from Messrs. Hopkin & Williams, gave me exactly the same results in this respect, although they differed very much in their pectizing properties. The 15·5 c.c. of soda required to saturate 5 c.c. of acid always neutralized in my experiments; but I am not prepared to say that this would be generally the case, and it is difficult to make in different hands a pipette always deliver separately the same amount of an oily fluid like oleic acid, therefore I proceed on the above basis of calculation.

The above process gives a solution 32 c.c. of which when operating on 100 c.c. of water represent 16° of hardness per gallon by Clarke's scale.

The advantages claimed are that the soap solution may be made in five minutes,—requires no titration against a standard water,—and is more permanent than those made from ordinary soaps.

The PRESIDENT moved a vote of thanks to Professor Tichborne, which was carried unanimously. He said this method seemed a practical improvement, inasmuch as it started with something quite definite, like soda, instead of something indefinite, like soap or commercial oleic acid. He would ask Professor Tichborne whether a solution made in that way really did keep better,—whether he had observed it for any length of time. It seemed natural for a soap solution when exposed to the air to split up, more or less rapidly, into an alkaline body and an acid oleate, the less soluble oleate being apparently more durable.

Mr. EKIN said he understood Professor Tichborne to say that when he added more alkali to what was a perfectly clear solution of soap, he got a pectinized form. Was it not possible that the

soap was insoluble in a solution of alkali, and that the pectinization was thus accounted for? The kind of soap he had found keep best was Pears' transparent; when dissolved in spirit it kept very satisfactorily. The method proposed for making a soap solution was perhaps about the most convenient, as it was a ready process that was always at hand. The great difficulty with Clarke's process had always been the trouble with the different kinds of soap.

Professor QUINLAN said he had often had occasion to make use of Clarke's test, and he could bear witness to the extreme trouble of making up the soap solution. This paper seemed to afford a method for readily making up a definite compound which would be very easy to use.

Mr. JACKSON asked if Professor Tichborne had used any other indicator than phenol-phtalein, litmus, for instance, and compared results, to see if they were always the same?

Mr. NAYLOR said the method he adopted was to purify the commercial oleic acid by freezing, then to dissolve in that oleic acid some freshly precipitated oxide of lead, and decompose the lead compound in the usual way. He did not quite see why this oleate of soda should be more definite made as Professor Tichborne proposed than by any other method, provided the oleic acid were purified to begin with.

Professor TICHBORNE, in reply to the question put by the President' said there was no doubt that this solution did keep better than those of ordinary soaps. Even Castile soap, which was supposed to be very definite, sometimes contained a great mixture. He did not claim that this solution would keep perfectly; like all soap solutions, after being kept some time, there was a kind of silky crystalline appearance upon it, which it was impossible to avoid; but it was quite different to what occurred when a soap was used which contained a large proportion of stearic and palmitic acids. Sometimes there was a deposit in the bottle, which would prevent any reliable work being done. One of his reasons for thinking that the gelatinous body which pectized with the two equivalents of soda was a definite compound was based on the fact, that if it were placed in a dialyser it acted very like a definite compound, He was not prepared at present to say that it was, but he thought this much more likely than that it was insoluble in caustic soda; because if another equivalent were added, still more soluble compounds were obtained; the gelatinous appearance passed away, and by the addition of another equivalent of sodium a perfectly soluble compound was produced. The use of litmus as a test was not

applicable; in the first place it was extremely difficult with such a thing as that to watch the reaction, the transition of litmus was so gradual. His experience of litmus was that it was about the worst indicator that could be used. He had observed with students, that what one called the point of neutrality with litmus was quite a different thing from what another did. The indication of litmus was a transition from the deep alkaline blue, through all the shades of violet to bright red with a strongly acid solution. Phenolphtalein was perfectly definite; take any oleic acid you liked, it was always sharp and there was not the slightest variation in the result. Another advantage was that with it a neutral solution was perfectly colourless, like water, but directly a minute quantity of acid was added, it developed a strong magenta colour. Lastly, he did not claim that the oleate of soda made by this process possessed any peculiar properties, or was more definite than any other solution; he only put it forward as a convenient mode of manipulating the volumetric solution of oleate of soda, without having to go to the soap, which involved two processes, making the volumetric solution first with soap, and then regulating it.

The next paper read was—

NOTES ON BRAZILIAN DRUGS.

By Charles Symes.

The drugs which I desire to bring before the notice of this meeting are three in number, and, although practically unknown in this country, I trust they will not be found altogether devoid of interest. Thèy have been received under the respectives names of "Resin de Angico," "Almasca," and "Guassatunga." The two former are products of the district of Maranham, in the north of Brazil (the locality from whence we obtain the finest copaiba balsam); the latter comes from the south, and was obtained in the neighbourhood of Porto Alagre.

Resin de Angico.—This is not a resin but a gum, of a deep brownish red colour, translucent, and breaking with a bright shining fracture. It occurs in pieces of from 1 to 3 ounces in weight, some of which have portions of bark attached to them. In the "Formulario ou Gui Medica," of Chirnoviz, it is mentioned as the product of *Acacia Angico*, and is said to be good for chest complaints; the same tree yielding an astringent bark. Mr. Holmes

has identified it with a specimen in the Museum of the Pharmaceutical Society, and has kindly furnished me with the small piece of bark which accompanies the specimen of gum. The pieces are very tough, but when broken up and dried at 212° for some hours it loses 12 per cent of moisture and can then be readily reduced to fine powder. When added to twice its weight of water it forms a thick semi-solid magma, and when this quantity of water is increased to eight times its weight, less than one-half dissolves, forming a reddish brown mucilage with a slightly acid reaction; the remaining jelly-like mass becoming liquid on the addition of a little caustic alkali, thus resembling tragacanth more nearly than it does gum arabic. It dissolves in proof spirit almost as completely as it does in water. The aqueous solution is rendered turbid by the addition of rectified spirit in excess, also by solution of oxalate of ammonia; it is not affected, however, by solutions of perchloride of iron, borax, or acetate of lead. As regards its medicinal properties, the only remark which accompanied it was similar to that of Chirnoviz,—"usa-se nas molestias do peito," "useful in chest complaints," which probably means that it is demulcent; but whether it possesses any special virtues in this respect, or whether it is in any way superior to the remedies of this kind already in use here, remains to be proved. A physician to one of the Liverpool hospitals has promised to determine this point.

Almasca.—This substance, received in sausage-shaped masses of about 12 inches in length and 2 to 3 inches in diameter, and covered with dried leaves, is evidently a species of elemi, but it differs in appearance and in some of its characters from the elemi of commerce, from the Brazilian elemi of the Hanbury collection, and also from that of Dr. Pereira at Bloomsbury Square. Except that it is more recent, and therefore much softer, it more nearly resembles the Brazilian elemi of Martin's collection, and Mr. Holmes is of opinion that it is produced by the same species, probably by *Icica heptophylla.* It comes from the same district as gum angico, but without any particulars of its use there. The term almasça indicates mastic, but from this it differs very materially. It is a soft, grey-looking resin, with whitish crystalline masses diffused more or less frequently through it, and possesses an aromatic, fragrant, and somewhat penetrating odour. Chloroform, ether, and absolute alcohol dissolves it without the application of heat; it also dissolves in boiling spirits of wine, specific gravity ·838; but at ordinary temperatures this breaks it up into a thick milky-looking liquid, dissolving only 65 per cent., the remaining portion corresponding

in its various characters with the substance known as *amyrin*. This may be purified by solution in boiling rectified spirit, from which on cooling, it separates in white crystalline masses.

Flückiger and Hanbury examined Manilla elemi, and found it to contain 20 per cent. only of this substance. They also obtained by distillation as much as 10 per cent. of a volatile oil which, examined with Wild's polaristrobometer, was found to be strongly dextrogyrate; whilst a sample of oil of elemi examined by H. St. Claire Deville was found to be strongly levogyrate. I have distilled a portion of this substance and have only obtained 7·3 per cent. of a colourless volatile oil, with an odour reminding one of fennel, and which corresponds with that of the "Pharmacographia" in that it is soluble in bisulphide of carbon, and gives a deep orange colour with strong sulphuric acid; but on careful examination I found it to be *optically inactive*.

Elemi is at present little used in medicine, but it seems to possess properties worth the attention of the medical profession and pharmacists.

Guassatunga.—On a recent visit to the south of Brazil, Mr. Joseph Hallewell found in use there a popular native remedy for snake-bite in the form of an alcoholic tincture of a golden yellow colour, put up in small bottles, with a label in Portuguese as follows:—"Para mordedeura de cobras e outros animaes veneno. Tomasse uma gota em uma colher d'agua de 10 em 10 minutos de 2 ou de 4 em 4 horas conforme a gravidade de caso, nas criancas metade ou menos. Sobra as mordedura couserva-se panos embebidos em 4 colheres d'agua com 10 gotas." Thus in English:—"For the bites of snakes and other venemous reptiles. One drop to be taken in a spoonful of water every ten minutes for two or four hours, according to the severity of the case; for children, half or less. Mix 10 drops in 4 spoonfuls of water, in this soak a cloth and apply to the bite or wound."

Assuming this to be a remedy of some amount of activity, Mr. Hallewell procured a small quantity of casca de guassatunga, the bark from which this tincture is prepared. It is the produce of a tree inhabiting the borders of Urúguay, and occurs in pieces of from 2 to 4 inches in length, from 1 to 2 inches in width, and $\frac{1}{16}$ in thickness, hard and breaking with a short, non-fibrous fracture. It is of a fawn colour with a greenish brown tint diffused irregularly over it, paler on the outer than on the inner surface, and possesses a slightly bitter taste.

Treated with ether it yields a bright green resinous substance;

with alcohol a golden yellow tincture is obtained, and the marc infused in water yields a brown liquid which on evaporation produces a dark brown extract. Altogether this treatment removes 24 per cent. of its original weight. The tincture, treated with the usual reagents, gave characteristic indications of the presence of an alkaloid, and I have, in fact, been able to separate a small quantity of such a body in a crystalline form, but only sufficient for examination with the microscope. On the receipt of a further supply, I hope by the aid of medical friends to determine more exactly its physiological action, and also to make a further investigation of it chemically.

The PRESIDENT said it was obviously desirable in the interest of pharmacy that they should have early information respecting drugs likely to be imported, not merely such statements as could be obtained from price lists, but information concerning their chemical, physical, and botanical properties, such as Dr. Symes had given them in his paper, and for which the Conference would certainly accord him a vote of thanks.

A vote of thanks having been passed,

Mr. ATKINS said he thought the line of procedure taken by Dr. Symes was well worth further consideration. If it was found that the natives of distant lands resorted to certain remedies, without any knowledge of the philosophy of their action, it was then very desirable to investigate the properties of those remedies scientifically. A large amount of work might have been already done, but it was in the rough, and followed what might be called the rule of thumb. A short time ago he received from a friend, who had gone to the Congo, a plant which was said to have a very specific action as a styptic, and he intended to hand it over to another friend and have it examined. There was a goodly number of generally accepted remedies, which came to them originally only on report as being used for certain diseases by the natives of distant lands, and if the matter were pursued further the number might be considerably increased.

Mr. GROVES asked if Dr. Symes had experimented with these drugs on any of the lower animals; but he presumed he would require a license before operating even on a mouse. It appeared to him to be a great obstacle to science that a simple thing like this which Dr. Symes had been kind enough to bring forward could not be dilated on satisfactorily in consequence of the action of the anti-vivisectionists. A dose of this medicine could not be given to a

mouse, although it might do the mouse good, in consequence of the existence of the Act of Parliament.

Mr. Groves, as senior Vice-President, then took the chair while the President read the following paper—

HALF AN HOUR WITH A FEW SHEETS OF THE NEW PHARMACOPŒIA OF THE UNITED STATES OF AMERICA.

By Professor Attfield, F.R.S.

In a letter, dated New York, August 4th, 1882, sent to the writer, as President of the British Pharmaceutical Conference, by Professor P. W. Bedford, President of the American Pharmaceutical Association, the following paragraph occurs:—"I recently forwarded to you proof sheets from the corrected plates of the first ninety-six pages of the text of the forthcoming Pharmacopœia of the United States. I now have the pleasure of sending the succeeding forty-eight pages. These are all that are, as yet, in presentable condition. They will serve to show yourself and friends of the British Pharmaceutical Conference that it will be a work worthy of the labour bestowed upon it. It is the only copy that has gone outside our Committee."

By way of showing our honorary member our appreciation of his compliment, and in order to give British pharmacists some information respecting the new Pharmacopœia, the following descriptive remarks are offered.

In point of size of page this sixth decennial revision of the United States Pharmacopœia exceeds its predecessor. That was a foolscap octavo, this is a full octavo. The leading names of the preparations are given in larger, plainer, black letters, the names of the components of the formulæ are also given in thick type, the quantity of each component now being printed not only in words, which, by the way, are in italics, but, in addition, in figures.

The former division into the two great classes of "Materia Medica" and "Preparations," the latter divided into over sixty subclasses, is no longer maintained. The work is now, therefore, in uniformity with the one simple alphabetical arrangement of the British Pharmacopœia.

The Chemical Nomenclature.—Four or five years before the fifth decennial revision, that of 1870, was published, I very strongly advocated that system of chemical nomenclature under which names

of salts of potash, soda, ammonia, baryta, lime, magnesia, etc., become names of salts of potassium, sodium, ammonium, barium, calcium, magnesium, etc. The system was adopted in the 1870 Pharmacopœia (issued in 1872), "to place the work in accord with the progress of chemical science." In acknowledging my endeavours for its introduction, the President of the National Convention presented me with the first copy of the Pharmacopœia sent to this country. I may be pardoned for expressing my gratification at finding that the system is retained in this 1882 revision, showing that the nomenclature has been found to be practicable and serviceable in the medicine and pharmacy of a great English-speaking people.

Weights and Measures.—The Convention for the fifth revision (1870) resolved on the abandonment of measures of capacity, but the Revising Committee were alarmed at the amount of time, labour, and cost involved in the application of the resolution to the whole of the Pharmacopœia, and objected that the execution of such directions entailed the employment of an untried system. The old wine gallon and troy pound, with their confusing divisions were, therefore, retained. These are now swept away, and "*parts*" by weight, substituted. Thus:—

Extractum Colocynthidis Compositum.

Compound Extract of Colocynth.

Extract of colocynth, *sixteen parts* . . .	16
Aloes, *fifty parts*	50
Cardamom, of No. 60 powder, *six parts* . .	6
Resin of scammony, in fine powder, *fourteen parts*	14
Soap, dried and in coarse powder, *fourteen parts*	14
Alcohol, *ten parts*	10

Then follow very full directions for preparation.

In cases in which some notice of volume as well as weight is required, the metric decimal system is employed. Thus:—

Extractum Ergotæ Fluidum.

Fluid Extract of Ergot.

Ergot, recently ground and in No. 60 powder, *one hundred grammes*	100
Diluted hydrochloric acid, *six grammes* . .	6
Alcohol,	
Water, each, *a sufficient quantity*,	
To make one hundred cubic centimeters . .	100

New Preparations.—The first seven pages of the Pharmacopœia (exclusive of prefatory matter, which has not yet come to hand) are almost wholly occupied with a new class of compounds termed ABSTRACTS—Abstracts of aconite, belladonna, conium, digitalis, hyoscyamus, ignatia, jalap, nux vomica, podophyllum, senega, valerian. Thus:—

Abstractum Jalapæ.

Abstract of Jalap.

Jalap, in No. 40 powder, *two hundred parts* .	200
Sugar of milk, recently dried and in fine powder,	
Alcohol, each, *a sufficient quantity*,	
To make *one hundred parts*	100

Moisten the jalap with *one hundred* (100) *parts* of alcohol, and pack firmly in a cylindrical percolator; then add enough alcohol to saturate the powder, and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and, having closely covered the percolator, macerate for forty-eight hours. Then allow the percolation to proceed, gradually adding alcohol, until the jalap is exhausted. Reserve the first *one hundred and seventy* (170) *parts* of the percolate, distil off the alcohol from the remainder, and mix the residue with the reserved portion. Place the mixture in an evaporating dish, and having added *fifty* (50) *parts* of sugar of milk, cover it with a piece of thin muslin gauze, and set aside in a warm place where the temperature will not rise above 50° C. (122° F.), until the mixture is dry. Lastly, having added enough sugar of milk to make the mixture weigh *one hundred* (100) *parts*, reduce it to a fine uniform powder.

Preserve the preparation in a well-stopped bottle.

These "abstracts" are, in short, alcoholic extracts, or, in other words, the dried residue of evaporated tinctures, mixed with sugar of milk and rubbed to powder, and of such a strength that one part represents two parts of the original root, leaf, etc. The exhaustion of the aconite is aided by tartaric acid, the hemlock by hydrochloric acid. For the ignatia and nux vomica the alcohol (having a strength of 91 per cent. by weight) is slightly diluted. Otherwise the directions for their preparation, respectively, are almost identical.

Other additions, to go no farther than the letter A, are acidum boricum, acidum hydrobromicum dilutum, acidum oleicum, acidum salicylicum, æther aceticus, aluminii hydras, ammonii phosphas, amyl nitris, amylum iodatum, apomorphinæ hydrochloras, auri et sodii chloridum.

Aconitia is omitted, atropina retained. The root only of aconite

is employed. Alcohol amylicum is omitted. Aloe Socotrina is the only variety recognised. Both varieties of aralia are dismissed. Acidum muriaticum has become acidum hydrochloricum, aqua chlorinii is now aqua chlori, sulphurets are now sulphides.

The doses of drugs were not given in 1870; they are not given in the present Pharmacopœia.

Temperatures are now stated in Centigrade degrees, with the Fahrenheit equivalent in brackets.

Characters, tests, and descriptions generally are given much more fully than before. No chemical symbols were given in the last edition; chemical formulæ, both of the old and new systems, are now given as in the British Pharmacopœia, and the molecular weight is appended to each formula.

Remedies which have come into use during the past decade find due place. Thus a cursory glance at these one hundred and forty-four pages reveal cinchonidine sulphate, codeine, one simple elixir—of orange,— eucalyptus leaves, fluid extract of guarana, extract of malt, fluid extract of pilocarpus.

Critical remarks would, at present, be out of place, but Professor Bedford's statement would seem to be thoroughly well founded, namely, that much labour has been worthily bestowed on this sixth decennial revision of the Pharmacopœia of the United States of America.

The CHAIRMAN said that the hearty thanks of the meeting were due to Professor Bedford for his considerate courtesy in forwarding an early copy of an interesting portion of the new United States Pharmacopœia. The members were also very grateful to Professor Attfield for his paper thereon, though, as he said, they must wait until the work was published in its complete form before criticising it. Then an evening or two might very profitably be devoted to its discussion. At present he could only say that this new Pharmacopœia seemed to be distinctly in advance of its predecessor.

Professor REDWOOD said the general feeling must be one of gratitude to the President for bringing this subject under the notice of the Conference. As had been already said, this was not the occasion to enter on anything like a critical notice of even what had been thus briefly brought under their notice; when the work came into their hands it would be very greatly appreciated no doubt, especially as a movement was now being made towards the production of a new edition of the British Pharmacopœia, and the oppor-

tunity of observing the results of the investigations made on the other side of the Atlantic, and the conclusions arrived at by the able pharmacists there, would be very valuable to those whose duty it would be to prepare a similar work for use in this country. One remark of a general character he might make, viz., that in this country, and especially amongst those who at present had the legal authority to prepare and issue the Pharmacopœia—the Medical Council—there was a far greater amount of conservatism than existed on the other side of the Atlantic; and he had no reason to anticipate that in the new edition of the British Pharmacopœia changes so considerable as those which appeared in the new edition of the American work would be introduced. One principle acted upon in this country was that it was not justifiable to introduce into the Pharmacopœia new preparations which had not been proved in medical practice. Such preparations as "abstracts," to which Professor Attfield had alluded, were an entirely new class, and the principle which had been hitherto acted upon by the Medical Council was that any such preparations ought to come into general use before they were introduced into the Pharmacopœia. There were certain changes alluded to which had been previously adopted, and there were others which he had not the slightest doubt would be adopted in any subsequent edition, such, for instance, as the nomenclature, which he believed was entirely approved of by the Committee of the Medical Council who had charge of the matter. With regard to the weights and measures, that was a point with reference to which he had no doubt some change would be made, possibly in the direction indicated in the American edition, which he himself advocated some years ago, when he worked it out and submitted it to the Pharmaceutical Society, ordering parts by weight. Whether that would be the method adopted he could not anticipate, but it seemed to him under existing circumstances by far the most rational mode of treating the subject. The adoption of a new system of weights and measures, new to medical men in this country and to those pharmacists whose studies had not been in the scientific line, would lead to a great deal of opposition if attempted hastily. In the present edition of the Pharmacopœia metric weights and measures were recognised where they could be applied in processes of volumetric testing, but even the Americans had hesitated to adopt the system entirely. On the whole, he should say the plan they had adopted of having parts by weight was the one which would be most likely to meet with general approval. He had only had a hasty glance at these sheets, and did not know that

there was anything else he could add. He was quite sure that when the complete work came into their hands it would be very fairly and liberally examined, and whatever was thought to be really beneficial, and not too much of the character of untried novelties, would receive full and fair consideration.

The Conference then adjourned until the following morning.

Wednesday, August 23.

The PRESIDENT took the chair at half-past ten, and the first paper read was—

ON SOME REACTIONS OF ARSENIC.

BY W. A. H. NAYLOR, F.C.S., AND J. O. BRAITHWAITE.

Three years ago one of us devoted some attention to the action of certain reducing agents on arsenic acid, and as a result devised and published a method for the volumetric estimation of this body based upon its reduction by hydriodic acid. First in order among the substances tentatively employed at that time was oxalic acid, which was thought not to have been previously studied in this connection. The result of the experimental inquiry was so far disappointing as to induce the belief that it could not readily be applied to the purpose of reducing arsenic compounds. Subsequently the discovery was made that not only had oxalic acid been tried in this capacity, but that in the hands of the experimenter it had proved a complete success. An account of this interesting observation is given by the author, M. Patrouillard, in the *Répert. de Pharmacie*, iii., 582, an abstract of which may be found in the *Pharmaceutical Journal* for November 27, 1875. His preference for oxalic acid over the reducing agents commonly employed, as sulphurous acid and alkaline hyposulphites, is founded on its solubility and the comparative ease with which it can be obtained in a state of purity. This discovery of Patrouillard received additional importance and credible acceptance when a place was assigned it in a standard text-book of chemistry. In regard to it, the manual referred to has the following statement:—"Arsenic acid is easily reduced to arsenious by the action of reducing agents such as sulphurous or oxalic acid—

$$(H_3\,As\,O_4 + H_2\,C_2\,O_4 = H_3\,As\,O_3 + H_2\,O + 2\,C\,O_2).$$"

These latter opinions contrasted too strongly with the one first quoted to encourage the hope that on mature reflection some ground of agreement would be found. It was therefore resolved when opportunity offered to repeat the old experiments, extend them if necessary, and perform others on the lines laid down by Patrouillard. This we have done conjointly, and have pleasure in now submitting the results. Here we would remark that while the author in his communication supplies but little data regarding the mode of testing his reduced compound, he is commendably explicit in his narration of the process intended to effect the desired reduction.

His instructions may be usefully reproduced:—

"10 à 15 grammes du sel à essayer sont dissous dans l'eau distillée, 50 grammes environ; on y ajoute 50 centigrammes d'acide oxalique crystallisé et l'on entretient la dissolution pendant à peu près cinq minutes à la température de l'ebullition; on filtre si cela est nécessaire et lorsque la liqueur est un peu refroidie on l'acidifie assez fortment par l'acide sulfurique. Dans cette liqueur acidulée on fait passer un courant de gaz hydrogène sulphuré. . . . Si le sel essayé contient au moins 2 pour 100 d'arséniate de potasse, par exemple, le précipité jaune floconneux de trisulfure d'arsenic se formera immédiatement."

The following experiments may be cited in illustration of our mode of working:—

Experiment 1.—·25 gram of arsenic oxide dissolved in 50 c.c. of water was boiled for half an hour with ·5 gram of oxalic acid.

Experiment 2 was identical with No. 1, except that the proportion of oxalic acid to arsenic oxide was doubled, and the boiling continued for two hours.

Experiment 3.—15 grams of sodium nitrate containing 2 per cent. of added arsenic oxide were dissolved in 50 c.c. of water. ·5 gram of oxalic acid was introduced, and the solution boiled for half an hour. On examining the respective solutions for traces of arsenious acid, negative results were alone obtained. The tests applied in searching for evidences of reduction may be briefly described. The solution was carefully neutralized with ammonia, barium nitrate added to complete precipitation, and filtered. The filtrate was boiled with sufficient sodium carbonate to convert the barium arsenite into a soluble salt, and withdraw from solution the excess of barium reagent. It was then filtered, the filtrate evaporated to a low bulk and divided into three portions. To one was added a little caustic soda, followed by the cautious addition of a weak solution of mercuric chloride. The first drop coloured the

liquid permanently yellow. The nature of this reaction will be dealt with presently; for the moment it may be regarded as indicative of the absence of any arsenite. To another portion was applied the copper test in a modified form. In what this modification consists will be described shortly; suffice it to say that no cuprous oxide was formed, and therefore inferentially no reduction of the arsenic oxide had taken place. To the third portion, after acidifying with sulphuric acid, a weak solution of potassium permanganate was added. A pink tint was at once imparted to the liquid, which did not become discharged on shaking. Advantage was also taken of the extreme delicacy of iodine as a test for arsenious acid, it being only necessary to substitute the corresponding bicarbonate for the monocarbonate of the alkali employed in effecting the decomposition of the barium arsenite. By its use, too, no appreciable reduction was obtained. As a demonstration that these tests are adequate to the detection of small quantities of arsenious acid, in respect of the conditions under which they were applied, it may be stated that satisfactory indications of the presence of this substance were afforded by each, when to one of the experimental solutions not more than 4 milligrams of arsenious oxide were added.

Failing to procure any evidence of a reduction, the original experiments were repeated, and another class of reagents applied. These afforded abundant proof of the existence of arsenate. Having removed the oxalic radical and obtained the arsenic compound in the form of an alkaline salt, the respective solutions were separately examined. When neutralized they gave a chocolate coloured precipitate with nitrate of silver. With excess of ammonia and magnesium mixture a cloud was instantly produced, followed by a copious crystalline deposit on standing. And when acidified with hydrochloric acid, iodine was rapidly liberated on the addition of a 20 per cent. solution of hydriodic acid.

Experiment 4.—This differed from the preceding ones in that the boiling was conducted in sealed tubes, ebullition being maintained for from five to ten minutes. One tube was opened beneath the surface of clear baryta water, but no tangible proof of its containing carbon dioxide was obtained. Nor did the enclosed liquid respond to the before-mentioned tests for arsenious acid.

Experiment 5.—1 gram of oxalic acid and ·2 gram of arsenic oxide were dissolved in 50 c.c. of water, and introduced into a small flask carrying a delivery tube depressed beneath the surface of mercury. Having replaced the small volume of air in the flask

with hydrogen, a tube containing baryta water and mercury was drawn over the end of the exit tube. The contents of the flask were then vigorously boiled. At the end of ten minutes the baryta water was distinctly opalescent, which was proved to be due to a little oxalate carried over with the steam. No barium carbonate was produced.

Experiment 6.—This consisted in dissolving ·200 gram of arsenic oxide and ·500 gram of oxalic acid in 50 c.c. of water, and boiling for half an hour. The oxalic acid was then determined gravimetrically, when it gave the equivalent of ·624 gram of calcium sulphate. A second experiment conducted simultaneously and in precisely the same manner, but omitting the arsenic oxide, gave the equivalent of ·622 gram of calcium sulphate. We conclude, therefore, that under these conditions the oxalic acid suffers no decomposition.

Experiment 7.—50 c.c. of a 2 per cent. solution of oxalic acid containing ·2 gram of arsenic oxide was boiled for half an hour, and, when cool, strongly acidified with sulphuric acid. Through the solution was transmitted sulphuretted hydrogen. No yellow sulphide made its appearance for the first five minutes, in ten minutes a distinct precipitate had fallen, and it was not until the gas had passed through continuously for four hours that decomposition could be declared complete. The sulphide was collected, dried, digested repeatedly in carbon bisulphide, and filtered. The filtrate left, on evaporation, ·006 gram of sulphur.

The pure sulphide was examined in regard to its degree of sulphuration, and was found to exist mainly in the penta-condition. Hence we infer the absence of any indirect action between the sulphuretted hydrogen and the acids by which the arsenic might become reduced. It was now thought that we had arrived at that stage of our inquiry when we might legitimately discontinue our experiments, and accept the conclusion to which they unmistakably pointed. We therefore express the opinion that oxalic acid exerts no reducing action under the conditions described by Patrouillard and ourselves.

Passing from this subject, we proceed to give an account of our method of employing the copper test. It is based upon the fact of the solubility of cupric arsenate in the double tartrate of potassium and sodium. It is indeed a modified Fehling solution. The copper solution, as ordinarily prepared, cannot be substituted for it on account of the large quantity of double tartrate present which seriously interferes with its delicacy as a test. It should contain

but little more double tartrate and caustic soda than would enable it to withstand boiling when diluted with twice its volume of water. Our formula for such a solution has the following proportions:—

Cupric Sulphate, recrystallized . .	·200 gram.
Water, to measure	50 c.c.

Dissolve.

Tartrated Soda, crystallized . . .	·500 gram.
Caustic Soda	5·00 grams.
Water, to measure	50 c.c.

Dissolve.

The two solutions are kept separate, and mixed in equal proportions when required for use. The convenience of this mode of employing the copper test is best realized when search has to be made for traces of arsenite accompanied by much arsenate. By this simple modification the arsenate is held in solution, and the inconvenience of filtering a strongly alkaline liquid, or patiently waiting until the insoluble copper compound has subsided, is obviated. Moreover, in our hands it has conduced to accuracy, from the readiness with which the amount of copper desired to be taken may be apportioned. As affording some idea of its capability, it may be mentioned that with 1 milligram of arsenious mixed with 2 decigrams of arsenic acid, it will give on boiling a decided reduction. Its delicacy is, however, materially impaired by the presence of certain organic acids, as oxalic, citric, acetic, and tartaric. Sulphates and nitrates do not interfere, nor do chlorides, unless present in quantities proportionately large.

As a matter of scientific interest, several attempts were made to apply the test volumetrically, but in every case a point was reached at which the copper solution refused to be reduced by the arsenic. Solutions containing various strengths of copper were employed, but not one could be made to yield, in a series of experiments, accordant results. At present, therefore, we are not able to offer an opinion upon its applicability to this purpose.

We now return to consider more fully a reaction which has received from us only a passing notice. We refer to the decomposition which takes place between arsenious acid and mercuric salts. In manuals of chemistry we are informed that when the action takes place between mercuric nitrate and an alkaline arsenite, mercuric arsenite is formed, and that this compound in contact with caustic alkali gives reduced metal. If to these facts be added the two observations of the solubility of this compound in excess

of alkaline arsenite and in nitric acid, the most has been said that appears to be known about it. The fact that we have taken advantage of this decomposition by employing it qualitatively as a test for arsenious acid has already been referred to, the only difference being our substitution of the chloride for the nitrate. Here it may be permitted us to offer some remarks on the test itself. When mercuric chloride is added to a solution of arsenious acid only moderately alkaline, the solution remains clear, and upon standing becomes opalescent to a degree dependent on the amount of arsenic present. If, however, the solution be rendered strongly alkaline with caustic soda or potash, and then a weak solution of mercuric chloride be added, the mercuric oxide at first produced quickly disappears, leaving as before a clear solution, which rapidly becomes cloudy, and if set aside gives a greyish deposit of metallic mercury. Again, if the solution be not only strongly alkaline, but boiling, the liquid will assume a dark colour the instant the mercuric chloride is added. Assuming, for the moment, that the arsenic exists entirely in the higher state of oxidation, the mercuric oxide produced by the first drop of mercuric chloride will colour the solution permanently yellow. Before endeavouring to extend the usefulness of this test by attempts at making it quantitative, it was necessary to satisfy ourselves on two points. These were the nature of the steel grey deposit and the condition in which the arsenic existed at the end of the reaction. That the deposit of reduced metal was free from corresponding oxides was verified by its insolubility or prolonged digestion in a 5 per cent. solution of hydrocyanic acid. That as a result of the action of the mercuric chloride, the arsenious had been wholly converted into arsenic acid, was indirectly proved by its failing to afford any evidence of an arsenite, and directly by the marked manner in which it responded to the tests for arsenates. From a knowledge of these facts we were enabled successfully to apply our test to the volumetric estimation of arsenious acid. For this purpose standard solutions of mercuric chloride and alkaline arsenite were prepared of strengths corresponding respectively to 13·55 grams of mercuric chloride and 4·95 grams of arsenic trioxide per litre. The mode of application consisted in delivering the mercuric solution from a burette into a measured volume of the arsenic solution previously heated to the boiling point, and rendered strongly alkaline with caustic soda. When the mercuric oxide ceased to disappear and from its presence imparted a permanently yellow tint to the liquid, the reading of the burette was taken. Operating in this way we learnt

that the reaction took place between 1 molecule of arsenic trioxide and 2 molecules of mercuric chloride. After a little reflection the following equation in two stages was constructed to account for the facts thus far acquired:—

$$As_2\,O_3 + 2\,Hg\,Cl_2 + 4\,K\,H\,O = 2\,Hg''\,H\,As\,O_3 + 4\,K\,Cl + H_2\,O$$

representing first stage of the reaction.

$$2\,Hg.\,H\,As.\,O_3 + 6\,K\,H\,O = Hg_2 + 2\,K_3\,As\,O_4 + 4\,H_2.\,O$$

representing final reaction.

Or, as one equation—

$$As_2\,O_3 + 2\,Hg\,Cl_2 + 10\,K\,H\,O = Hg_2 + 4\,K\,Cl + 2\,K_3\,As\,O_4 + 5\,H_2\,O.$$

Confirmatory evidence of the correctness of this equation was supplied by weighing the reduced mercury, and by determining the amount of arsenic acid produced in the reaction. Taking ·015 gram of arsenious acid, the mean of two experiments gave ·097 gram of metallic mercury, theory requiring ·098 gram. From the same weight of arsenious acid was obtained as the mean of two results a quantity of the double magnesium and ammonium arsenate equivalent to ·059 of arsenic pentoxide, theory requiring ·057 gram. Although so far as is known to us no molecular formula has been assigned to mercuric arsenite, we consider that in representing it as $Hg\,H\,As\,O_3$ we are acting in harmony with the results of our experiments. The isolation of this body in a state of purity is a task requiring the observance of certain conditions with which at present we confess ourselves but imperfectly acquainted. For instance, if mercuric nitrate be employed as the precipitant, the product is invariably contaminated with mercuric oxynitrate If in place of the nitrate the chloride be used, followed by the addition of alcohol, a precipitate falls consisting solely of calomel.

We conclude this paper by giving a series of experiments intended to afford an idea of the degree of accuracy of which our volumetric method is capable:—

$As_2\,O_3$ taken.	$As_2\,O_3$ found.
·051 gram.	·052 gram.
·081 „	·080 „
·061 „	·062 „
·071 „	·070 „
·092 „	·093 „
·076 „	·077 „
·086 „	·087 „
·097 „	·098 „

Equally good results may be obtained in presence of much chloride, sulphate, carbonate, or bicarbonate, but phosphates prohibit its use.

The PRESIDENT proposed a vote of thanks to the authors of the paper, which was carried unanimously. He said this was a paper of considerable importance, and perhaps the most important point was the investigation into the conditions under which arsenic acid and other arsenates were reduced to arsenious acid and other arsenites; for no analyst examining the contents of a stomach, or a piece of wall paper, or anything else, would dare to say that arsenicum was absent until he had not only examined it in the ordinary way by the usual tests for arsenicum, but had taken the precaution of adding some reducing agent, in order that arsenates might be reduced to arsenites, and so the possibility of missing arsenic be removed. Probably most who had employed these tests had used sulphurous acid for reducing the arsenates, but M. Patrouillard had stated so distinctly that oxalic acid would do as well, that, inasmuch as oxalic acid was always at hand, whereas sulphurous acid had usually to be prepared, it was not astonishing that many experimenters had gladly accepted the statement, perhaps a little hastily, and used oxalic instead of sulphurous acid. Having a great respect for the French investigator, he confessed he had accepted his statement and recommended his students to use oxalic acid, but the denial by Messrs. Naylor and Braithwaite of this reaction was as distinct as M. Patrouillard's assertion, and, therefore, attempted reduction by oxalic acid should perhaps be discontinued until the matter was further investigated. He hoped M. Patrouillard would take notice of this paper, and clear the matter up. He said that after heating with oxalic acid, adding sulphuric acid, and passing sulpuretted hydrogen through the fluid, there was an immediate precipitation of dry sulphide of arsenicum, and it would be remarked that he used the word "immediate." The authors of this paper, having done exactly what M. Patrouillard directed, got no precipitate for five minutes, then a cloudiness and so on, and the precipitation was not complete for several hours. This was not only questioning an inference, it was denying a stated fact, and he hoped M. Patrouillard would make further experiments in order that this important question might be definitely set at rest.

Mr. MARTINDALE said there was a pharmaceutical preparation indirectly connected with the subject of the paper, which he should

like to mention, because it had not given him much satisfaction. It was liquor sodæ arseniatis. The preparation, according to the Pharmacopœia, was never satisfactory, and he should be glad to know if Mr. Naylor had ever volumetrically estimated it by any of the reducing agents, such as he had suggested. He had tried to estimate it by means of the volumetric solution of nitrate of silver, without getting good results: it threw down chocolate-coloured arseniate of silver, but it was difficult to estimate when the decomposition was complete, and he had hoped from Mr. Naylor's previous paper that something might be done by the use of the volumetric solution of iodine. The formula in the Pharmacopœia which directed the arseniate of soda to be dried up to a certain degree never gave him very satisfactory results, and he understood from some medical practitioners that they obtained very varying results from the medicine as dispensed by different chemists. If some volumetric test could be given for it, it would be a great help to its being prepared of one uniform strength.

Mr. KINGZETT asked if the authors had used oxalic and sulphuric acids in conjunction, which he understood was the process of the French chemist. If sulphuretted hydrogen were used at the same time it would afford an increased facility for reduction taking place, because there would then be something which would combine with the arsenic at the moment of reduction.

Mr. BRANSON said he found the volumetric method with uranium nitrate or acetate very convenient for the estimation of arsenates, using potassium ferrocyanide as an indicator.

Mr. NAYLOR said he had never found any difficulty in preparing the liquor sodæ arseniatis, unless the temperature had been allowed to rise a little too high, when there was a danger of the arsenate becoming reduced to arsenite; of course if a very high temperature were used it would become reduced very considerably. As to Mr. Martindale's further question, it had been partly answered by Mr. Branson. If a volumetric method were desired, uranium acetate might be employed, or the method suggested some time ago by hydriodic acid, provided sufficient hydrochloric acid were used at the same time, otherwise there would be an equivalent quantity of iodine liberated. With regard to Mr. Kingzett's question, he could only say that they followed M. Patrouillard's directions exactly. The arsenic acid was boiled, and when slightly cooled the sulphuric acid was added.

The next paper read was on—

SOME RESULTS OF THE ACTION OF THE DIGESTIVE FERMENTS UPON DRUGS.

By George Brownen, F.C.S.

I purpose in this paper to call the attention of this Conference to some of the results of the action of the solutions of the digestive ferments upon medicinal substances.

Preparations containing the gastric and pancreatic ferments have recently become famous as dietetic auxiliaries; I need not therefore, occupy time with references to peptonized foods or drinks, or even give a detailed account of their discovery and development.

In 1836, Schwann applied the term pepsin to an albumen-dissolving product obtained from the gastric juice, and subsequent investigations seem to show that the gastric juice contains more than one distinct ferment, or that this ferment may be modified by the process of extraction, so as to assume new or lose some of its original properties.

This is also true of the ferment or ferments of the pancreas. Bourchardat, in 1845, and Claude Bernard, a few years later, discovered or described some of the properties of the pancreatic secretion. In 1862, Danilewsky asserted the existence of three special ferments in the pancreatic juice, and since that time Von Wittich, Kuhne and others have extracted and examined the ferments and applied them to dietetic purposes.

But there is a field of research outside the range of the peptonized foods, which merits the attention of the pharmacist and the physiologist. It is this, What are the possible modifications which drugs may undergo in contact with the digestive secretions, and will an examination of such results be of service in the preparation, combination, or preservation of crude material, so as to secure the best physiological results?

Solutions of the gastric ferment were obtained from the stomach of the pig, by means of dilute glycerine and also with acidulated water and alcohol. Pancreatic solutions were also obtained from the pancreas of the pig, by means of glycerine and a feebly alkaline as well as an acidulated dilute alcohol. The first series of experiments were made with these solutions and crude drugs; the second with definite principles.

An infusion of rhubarb, ½ ounce to the pint of water, was prepared and as soon as the infusion had cooled to 50° C., some of the acid

solution of pepsin was added, and the temperature maintained by means of the incubator for two hours; 47 per cent. of the rhubarb was thus rendered soluble. The mixture was then neutralized by sodium carbonate, the alkaline solution of pancreatin added, and the temperature sustained for two hours longer. The insoluble portion was then found to consist of cellulose and earthy salts, retaining a small quantity of colouring matter. The 240 grains of rhubarb left an insoluble residue of 96 grains.

Infusion of calumba prepared with boiling water and passed through the same processes of digestion, gave somewhat similar results. The spongy cellulose was associated with a trace of berberia; 500 grains of calumba left an insoluble residue of 172 grains.

Cinchona and opium, upon the other hand, behaved somewhat differently; the gummy and extractive matters were dissolved and retained in solution, but a considerable portion of the alkaloids was left in the insoluble marc. Cinchona was about half soluble (48 per cent.) and opium about two-thirds, or 68 per cent. Quinine and morphia could be detected in the respective solutions, and were also readily found and extracted from the insoluble residues. The cinchona tannin was destroyed in the digestive process and failed to precipitate gelatine, but this peculiarity will be noticed when we come to the action upon definite substances.

The possibility of the digestive ferments attacking gum acacia was deemed of some importance, in consequence of gum being used in a test demonstrating the acidification of fat by the emulsive ferment of the pancreas. Strong solutions of white gum arabic were therefore prepared and submitted in the incubator to the action of the gastric and pancreatic solutions. The feebly acid solution containing the gastric ferment remained clear even after several hours' digestion. A slight change, however, had occurred in the mixture, as a portion removed, neutralized with soda and boiled with Fehling's sugar test, showed a slight reduction to cuprous oxide, whereas a portion of the original solution undigested, but kept at the same temperature and under similar conditions, was not affected by the glucose test.

The mucilage digested with the akaline pancreatin solution soon became cloudy, and ultimately a white precipitate was formed. The mixture seemed less viscid than that containing the gastric ferment, and a portion of the solution gave the violet reaction of peptone. The precipitate was found to consist of calcium carbonate, with a considerable quantity of the diastastic ferment carried down

by the precipitated chalk. This precipitate, carefully washed, was found to possess strong amylolytic but no proteolytic or emulsifactive power.

I should, therefore, think that the arabin of gum acacia remained unaffected by the processes, and that the peptonizing change was wrought upon some slight impurity of gum, possibly containing nitrogen; this point, however, is reserved for further investigation.

Closely allied in physical character to gum, and holding an intermediate place between foods and medicines, are the mucilages obtained from Irish and Iceland moss. On Irish moss the alkaline extract of the pancreas seemed to exert very little action. The proteolytic ferment of the pancreas extracted with acids soon destroyed the viscidity of the mucilage, and divided the jelly into soluble and insoluble portions. These results were also obtained by the digestion of chondrus jelly with solution of pepsin: the products resembled and perhaps were identical with parapectin and pectic acid.

Cetraria, or Iceland moss, behaved somewhat differently. A jelly of this substance retained its colour, but became flocculent when acted upon by the gastric ferment. On the other hand, the pancreatized jelly retained more of its viscidity, became deeper coloured, and gave a deposit of yellowish white flakes. These flakes under the microscope were found to consist of non-crystalline masses (pectic acid ?)

The digestives were found to produce or accelerate the pectic fermentation by some experiments upon the pectin of the turnip.

I must now leave the consideration of this part of my subject, and call your attention to the action of the ferments upon more definite substances. The acidulated extract of the gastric juice decomposed a watery solution of salicin very slowly and imperfectly; saliretin was formed, but it was associated with undecomposed salicin. On the other hand, the pancreatic ferment split up the salicin into saligenin and glucose, and the saligenin, separated by solution in ether and subsequent crystallization, was obtained in the form of white laminæ or scales.

A well-washed sample of jalapin remained intact after digestion with the pepsin solution, but pancreatic digestion withdrew a copper-reducing substance from the jalapin.

Santonin was unaffected by gastric and pancreatic solutions.

A solution of tannin treated with the acid pepsin solution became turbid, but the turbidity disappeared when a little more hydrochloric acid was added to the mixture. The results of several

hours' digestion were, however, negative; but the pancreatic ferment, upon the other hand, rendered the tannic acid incapable of precipitating gelatine or isinglass, because of the transformation into gallic acid.

These are a few of the results obtained by digesting drugs with extracts from the digestive organs; they throw open a wide field for the pharmacist, and one deeply interesting to the physiologist.

The digestive process seems to consist of the hydration or splitting up of insolubles, and, as far as my observation has gone, the microzymous or bacteroidal fermentation need not occur until the primary digestion is in an advanced stage. For instance, in the digestion of the proteids, albumen, and fibrin, I have noticed occasionally a point when the solution or hydration of these substances by the acidulated pancreatic secretion passes into the formation of leucin and tyrosin. I refer to the acidulated pancreatic solution, as the researches of Dr. Roberts and others upon the amylolytic power of a neutral or feebly alkaline pancreatic extract have seemed to throw into the shade the proteolytic power of acidified pancreatic juice, which, although incapable of transforming starch paste into sugar and dextrine, yet still possesses the power of dissolving fibrine or albumen, and ultimately splitting them up into leucin, tyrosin, and an organic acid. This is not the result of the putrid fermentation of albuminous bodies, as in this latter case the formation of ammonia renders the reaction alkaline instead of acidulous.

The emulsive ferment, as well as the proteolytic, in action produces acidity, although in the emulsification of fat the acidity is generally very slight and insufficient by itself to account for the minute subdivision of large proportions of fat. In the digestion of proteids the acidulous body is glutamic acid, and I think it may also occur in the emulsification of fats, as I have often sought for fatty acid and glycerine as separate bodies in emulsified fats; but I have always failed in my attempts to obtain any proportionate quantity which would justify me in ascribing emulsification of fat to their formation and presence.

The PRESIDENT proposed a vote of thanks to Mr. Brownen, which was carried unanimously. He said the results which Mr. Brownen had described were extremely important, and they must all hope that he would continue to work on this very large field of investigation. Ferments or septics, on the one hand, and antiferments or antiseptics, on the other, were now largely administered to human beings, while very little indeed was known of their action or the

extent to which they retarded action when thus introduced into the system.

Mr. BENGER said the members of the Conference were much indebted to Mr. Brownen for having initiated this very original line of investigation on the action of the digestive ferments. His results were sufficiently interesting to warrant them in hoping that they would get something still more definite in future. The paper would, however, have possessed additional value had it given a few comparative results. Taking, for instance, an infusion of rhubarb, Mr. Brownen said that, after digesting rhubarb with an acidulated pepsine solution, and then with an alkalized pancreatic solution, there was nothing left but 96 grains of cellulose and earthy salts out of 240. It would be interesting to know if, had the rhubarb been digested with water only, or with acidulated water, and then with an alkaline solution in succession, any different result would have been obtained. If he had tried that experiment, perhaps he would state the result. The same with reference to the calumba: of course there would in this case be an action of the pancreatic ferments on the starchy matter, as Mr. Brownen prepared the infusion with hot water instead of cold, as the Pharmacopœia directed. Another statement he should like to make a remark on, was:—That an acidulated pancreatic solution had no amylolytic action, but only proteolytic. That was quite contrary to his experience. He had always found a slightly acid solution, both amylolytic and proteolytic, quite as much so as a neutral or alkaline solution. In Dr. Roberts's process for the peptonization of milk, carbonate of soda was ordered to be added, not with a view of increasing the action of the pancreatic ferments, but to prevent the precipitation of metacaseine, should the patient boil up the milk before the completion of the digestive process, which he was generally directed to do. If it were rendered alkaline no precipitation took place.

Mr. KINGZETT said the same thing had occurred to him, in listening to this interesting paper, as had been mentioned by Mr. Benger. For instance, taking salicin: if it were boiled with a dilute acidulated solution, the compounds mentioned by Mr. Brownen would be obtained, viz., glucose and saligenin. It would be important to know how far the action observed was due to the ferments themselves, as distinguished from the alkali or acid severally employed. So far as regarded the splitting up of albuminous substances, the results mentioned were in agreement with those formerly worked out by Schützenberger, who had proved conclusively that albumen, when subjected to the action of hydration by ferments, or hydrolysis

by baryta water or dilute sulphuric acid, and so on, was split up into the two lesser molecules, hemiprotein and hemialbumen, one soluble and the other insoluble, though the insoluble part becomes soluble on further hydrolysis. On continuing the process, these subsidiary molecules are further split up, yielding more ultimate products, including some of those mentioned by Mr. Brownen, viz., glutamic acid, aspartic acid, tyrosin and leucin, etc., which substances were always formed as ultimate products of the hydrolysis of albuminoids induced by chemical agencies or bacteroidal life.

Mr. Plowman said every one must feel that in experiments of this kind the exact condition of things could never be obtained artificially in the laboratory, such as occurred in the human body, in which a mysterious factor, "vital action" or "vital force," exerted its influence. He maintained, however, that as far as possible they ought to imitate the conditions which existed in the human body. As an instance of the importance of this, he remembered a most interesting paper being read by Professor Redwood at an evening meeting of the Society, in which he showed that when so-called "dialysed iron" was poured into ordinary water, the iron was entirely precipitated, and that when that precipitate was dissolved in hydrochloric acid a solution was obtained which would not dialyse. If the idea were entertained that absorption of medicines was simply, or even mainly, owing to diffusion, this experiment seemed to show that dialysed iron would be worthless as a medicine; but it had been proved by medical men by actual observation that anæmic patients taking dialysed iron had had their condition considerably improved. As to the conditions which Mr. Brownen observed, the first thing that attracted his attention was that he performed these experiments at a temperature of 50° C., which of course was never reached in the human frame. At such a temperature as that any dilute acid solution would have a tendency to break up such bodies as salicin, independently of fermentative action. Another thing to be remembered in experimenting with pancreatic juice was this: the biliary secretion and the pancreatic secretion were discharged into the intestinal canal at a common orifice, and it was by no means determined what were the exact functions which the biliary secretion and the pancreatic secretion respectively fulfilled in the process of digestion. He should be glad to see some experiments performed in which the biliary was mixed with the pancreatic secretion, so as to ascertain the actual effect of the two secretions together. Mr. Brownen prepared an alkaline solution of the pancreatic secretion, and also a dilute alcoholic solu-

tion, but he did not say which he used in these experiments; he should be glad to know which was used, or if both, if similar results were obtained. With regard to the violet reaction of peptone mentioned by Mr. Brownen, Mr. Plowman said there was a special product obtained by the action of the pancreatic secretion on proteids, which gave a violet reaction with chlorine; and there was the common reaction of peptones, which was obtained by adding cupric sulphate and an excess of caustic potash. When a very small quantity of sulphate of copper was added, a red coloration was produced, but with an excess of the sulphate a violet colour was produced. He should be glad to know which reaction Mr. Brownen referred to. Because he got this violet reaction, Mr. Brownen supposed that there was some nitrogenous impurity in the gum which produced it; but as a matter of fact, pancreatic juice contained albumen in some considerable quantity, and an intrinsic digestion of itself went on immediately after it was secreted, by which peptones were produced, so that the pancreatic juice of any age would itself give the peptone reaction. With regard to the action of the acidified solution, he would remark that as a matter of fact large quantities of undigested starch pass from the stomach into the duodenum, not being converted into glucose or dextrine by the saliva. There was no doubt further, that the contents of the stomach were not immediately neutralized by the biliary and pancreatic secretions, and, therefore, it would be useful and economical for the ferments in the pancreas to be capable of acting on starch while the contents of the intestinal canal were still slightly acid. Further, it was proved that the actual body existing in the perfectly fresh and still warm pancreas had very little proteolytic action, and to that hypothetical body existing in the pancreas the term zymogen had been given. On keeping the pancreas for some time that zymogen was split up into the proteolytic ferments, and that change was also brought about very readily by dilute acids.

The PRESIDENT said there was one point mentioned by Mr. Plowman which it would be out of order for the Conference to discuss, and that was the question of vital force. On any other portion of this interesting subject he should be glad to hear further discussion.

Mr. GROVES suggested that when Mr. Brownen continued his experiments, he would try the action of these ferments on each other. It was often the practice to give the pancreatic ferment and the peptic at the same time, but he thought it not unlikely that they might digest and so destroy each other. As Mr. Plowman

had remarked, in the economy of nature they were added sucessively, first the saliva, then the gastric juice, then the pancreatine, and then the bile.

Mr. Atkins said that, bearing in mind the President's caution, he had only one remark to make, and that had no reference to the moral question, or the one which was open to discussion. It was simply this, that in all these experiments it must not be forgotten that there was a vital force, though they could not go into the question of its origin or nature.

The President said they must not even have any discussion on the question whether there was or was not such a force.

Mr. Atkins said he remembered that some years ago in America, some very interesting experiments illustrative of the processes and results of digestion, were made on an Indian who had had a portion of his chest shot away; those experiments were conducted in the stomach and outside it, by the same agents, and wonderfully different results were obtained. Another familiar illustration of the same thing was, that if you wanted to make sea water, you might ascertain by analysis the ingredients of sea water, and add them to fresh water, but you did not get the same result. In nature's laboratory there was something or other which made all the difference between artificial sea water and natural. One very interesting point in connection with this paper was as to the development of bacteroidal life. He understood that if the result of the processes of digestion were acid rather than alkaline, that development did not take place. This was an extraordinary fact, which was one rather for medical men than pharmacists to consider, but it was very interesting, and if it at all lay in the direction of Mr. Brownen's future experiments, he hoped he would pay some attention to it. If in the process of digestion there was an acid result, it was followed by an immediate extinction of that form of life which otherwise, perhaps in a few minutes, would be very largely developed.

Dr. Symes said he had made a note to ask the same question as Mr. Benger had put, because it struck him that the amount of residue was such as might be expected if the infusion had remained without the addition of the ferments. He should like to say, too, that this was rather a difficult investigation, inasmuch as, leaving out the vital force, these things were given, not to people in health, but to those who were sick, and consequently the results were not the same if one were experimenting on a healthy person. It was desirable, also, to follow as closely as possible the mechanical con-

ditions which surrounded the use of these medicines. He remembered the case of the dialysed iron referred to by Mr. Plowman; on that occasion Professor Redwood had mixed the dialysed iron with peptone, and had allowed it to digest for two hours in a glass bottle before attempting to dialyse it, and he pointed out then that he was not following the process of nature, under which a person began to digest the dialysed iron immediately it was mixed with the ferment, and the surrounding tissue was not a glass bottle, but the stomach, from which a certain amount of diffusion took place. All these points required consideration in prosecuting this study; he thought, too, that more satisfactory results might be obtained if the investigation were carried on, using diastase, than the animal ferments.

Mr. KINGZETT said the discussion ought not to close without reminding Mr. Atkins that the biliary secretion was not acid but alkaline.

Mr. SYMONS asked if Mr. Brownen had tried the action of these ferments on starchy matters.

Mr. BROWNEN, in reply to the question put by Mr. Benger, said that at the same time that the experiments were made in the incubator, they were also conducted on both acid and alkaline solutions of rhubarb, so as to control the tests. This would also apply to the remarks of Mr. Kingzett, because although he found that at the end of the time there was a small quantity of salicin split up by a temperature not exceeding 50° C., yet the greater portion of the salicin remained unaltered; he therefore presumed that the secretions had to do with the change which had occurred in the solutions he was then testing. A feeble acid solution was unquestionably amylolytic, but the amylolytic ferment acted more powerfully in an alkaline or neutral solution than the feebly acid solution; and if the acidity exceeded two per cent., it was almost completely neutralized or destroyed. Whether it could be reproduced again remained to be decided by further experiment. The temperature of 50° C. was adopted because it was the one at which he found the gastric and pancreatic ferments acted most rapidly without decomposition, though it ran very near that point. He therefore adopted that temperature, and never exceeded it, but many of his experiments were made at a much lower temperature than that of the human body, about 98° F. He used the higher temperature in order to obtain the maximum result of salicin, which he found was slowly decomposed even by the gastric ferment as well as by the pancreatic, and he wanted to

get, within a reasonable time, the maximum amount of work from those ferments. The solutions used were a mixture of alcohol and water rendered slightly alkaline in one instance for pancreatine, and then rendered distinctly acid in the other case, so as to obtain an acidulated solution ; the amount of alcohol and water being the same in each case. The glycerine experiment was made in order to see what the action would be without either alkali or acid. He used also, working in the laboratory of Messrs. Savory & Moore, their acid elixir and the neutral essence, testing them side by side with these other solutions, but he had not mentioned this in the paper, as he wished to avoid all trade reference. The violet reaction he obtained was with the copper solution, and not with chlorine. He tested the solution of gum, because in the lectures which Dr. Gamgee gave at the Royal Institution, he laid great stress on an emulsion of almond oil perfectly sweet, and the action upon it of a feebly alkaline pancreatic extract, which in a very short time became distinctly acid. He wanted to find out whether that acid was derived from the gum or from the oil, and he found that it was not derived from the gum, but from a small portion of the oil going into the acidulous state; but there was this other substance, which he supposed was a constituent of gum, not perhaps an impurity, but an invariable constituent of the best white gum, acted upon, although the arabin was not acted upon by these secretions. Although these ferments seemed to act, one in an acidulous condition, and the other best on starch in an alkaline condition, yet they seemed as they passed the duodenum to become rather alkaline than acid. Some extracts of food he had obtained in different degrees of digestion, and also in some experiments in which he had tried to simulate the digestive processes (*minus* the vital force, which was objected to), had led him to the conclusion that the bacteroidal fermentation need not occur in any of the conditions necessary for digestion. In fact, there seemed to be a point in the digestion of the proteids analogous to the transformation of alcohol into acetic acid. These bacteroidal forms set up putrid fermentation, which would invariably tend towards alkalinity rather than acidity. On raw starches he found very little action; that was why he boiled the infusion of calumba, contrary to the ordinary Pharmacopœia directions. He supposed the compilers of the Pharmacopœia wished to get rid of the starch, but in his experiment he wished to obtain the maximum action on cooked substances.

The next paper read was entitled—

REMARKS ON THE ROOT OF ACONITUM NAPELLUS, AND OTHER SPECIES.

By E. M. Holmes, F.L.S.

Although aconite has been used in medicine for at least a hundred years, and is recognised as one of the most powerful of medicinal agents, its internal use is not quite so general in this country as its properties might lead us to expect. Perhaps this is owing to variation in strength of the official preparations, and to the known danger of using too large a dose. How far this variability is due to a non-recognition in the Pharmacopœia of well-known facts, may be open to question; but it appears certain that the requirements of that book might be complied with, and yet that preparations very variable in strength might be the result. That such is the case is proved by the statements made by Mr. Cleaver concerning extract of aconite (*Pharmaceutical Journal*, [3], xii., 722), and by the recent experiments made with the alkaloid, which have shown that one commercial sample may be seventy times stronger than another.

The Pharmacopœia describes aconite root thus:—

The dried root of *Aconitum Napellus*, L. (*Pharmaceutical Journal*, [1], xv., 449). The root may be "imported from Germany or cultivated in Britain and collected in the winter or early spring, before the leaves have appeared."

In the first place the figure of the root referred to is totally inadequate to distinguish the root *A. Napellus* from that of other less poisonous species, the variation in form being very great, according to the age and position of the root. In the second place, the root imported from Germany is collected by peasants who, as a rule, are not possessed of botanical knowledge, and is sold without any guarantee that it is collected in winter or early spring; indeed, it is difficult to understand how the root of *A. Napellus* could be found before, or distinguished after, the leaves have appeared. Thirdly, the root is not cultivated as a crop in this country, because it could not compete in price with the German drug.

Under these circumstances it is easy to understand why the alkaloid of commerce varies in strength, and why the preparations are also liable to a similar fault. It is also obvious that even the most careful chemical investigations of the commercial root must be founded on an unreliable basis, and that the results obtained by

chemical analysis must in consequence be to a certain extent devoid of scientific value.

It becomes extremely important, therefore, that so powerful an agent should receive at the hand of the pharmacist far more attention than has hitherto been accorded to it, and that every means should be used to provide the medical profession with preparations of aconite as nearly as possible of uniform strength and perfectly reliable. This is the more desirable since aconite is now being used in the treatment of inflammation of the lungs, in puerperal and other fevers, and in acute cases in which prompt and reliable action is of the utmost consequence. The chief difficulty in making such a preparation is in obtaining the typical variety of the right species. De Candolle describes twenty-nine varieties of the official species, *Aconitum Napellus;* but whether all these forms, which possess the same specific botanical characters in common, have the same chemical constituents, and whether, like isomorphic crystals and isomeric bodies in general, they have a different physiological action, is very difficult to ascertain, seeing that it is by no means easy to identify them for the following reasons:—First, because a complete series of the members of the genus is hardly to be found for reference in any botanical garden or museum; secondly, because the varieties sold by florists are not always carefully named; and thirdly, because they cannot be procured in sufficient quantity for purposes of chemical investigation.

Moreover, botanist are not agreed as to the forms which should be placed under each species. Steudel enumerates about eighty which have been grouped under *A. Napellus* by different botanists. The aconites are so closely allied, and the varieties run so much into one another, like the willows, brambles, roses, mints, and cinchonas, that even De Candolle has placed the same plant under two varieties. Professor Maximowicz, who has paid considerable attention to the species occurring in Japan, remarks in a recent letter,—"The genus *Aconitum* is, botanically speaking, a most difficult one, not one characteristic holding its own from species to species. It is a matter of personal opinion, whether you accept a dozen species in all, while another thinks to separate thrice the number. I have observed them in Mandshuria and Japan very assiduously, and have despaired of finding well defined species, for there will arise intermediate forms between such as in most cases are thoroughly different. One would think these were numerous hybrids, but they are as freely seed-bearing as the various hybrid aquilegias used to be."

Although it is almost impossible to define accurately in botanical terms the different aconites, it seemed to me worthy of inquiry whether those available for pharmaceutical purposes might not be characterized sufficiently for all practical purposes. It is well known that the Japanese peppermint plant, although botanically it offers no character to separate it from *Mentha sativa*, is readily distinguishable by taste, and it is, therefore, natural to suppose that the different forms of aconite might be distinguished to a certain extent in the same way. Experimenting in this direction, I found that the roots of several species of aconite did not cause a tingling sensation when chewed, and that this was the case not merely with the Asiatic species, *Aconitum uncinatum*, *heterophyllum* and *palmatum*, but that also several plants which present the specific characters of *A. Napellus*, although easily distinguishable from it by habit, present the same peculiarity. Of these I may mention that forms which were supplied to me under the names of *A. Napellus* var. *pyramidale* and *paniculatum*, etc., did not cause tingling when chewed, while others, such as *Stoerckeanum* and *albiflorum*, produced a slight, and others again, such as *A. autumnale*, a very powerful tingling sensation. Here a difficulty is met with in the fact that the plants are not always correctly named, either in botanical gardens or in the collections of florists, from labels becoming displaced. But all of the aconites in which this variation occurs, so far as I have observed, flower later than the typical *A. Napellus*; so that if the Pharmacopœia added to its description, "the root obtained from plants flowering in May and June," and erased the words "imported from Germany," one cause of the unequal quality of the root would be removed. This is all the more important, since I have determined by direct inquiry that some florists would supply to a grower the plant flowering in May and June, and others would supply any variety of *A. Napellus* that happened to be in stock, no difference in the properties of the varieties being known to them. The only way to secure aconite of good and uniform quality appears to be to limit the official drug to home-grown aconite flowering in May and June and gathered when the plant is in flower. In this way there can be no mistake about the species, and the leaves collected at the same time could be used for making extract. Even if the root were thus not gathered in its most active condition, it would at all events have the advantage of uniformity of strength, which is of much more importance.

The aconite has the property of developing roots instead of leaf-buds in the axils of the lower leaves, provided that these are covered

with soil. Whether this property has been conferred on the plant with the view of enabling it to approach nearer to the surface when, as must often happen in its native mountains, the plant becomes almost buried by the fall of *débris*, or the earth washed away from the roots by the floods, or to propagate the species when not under favourable conditions for producing seed, it could at all events be turned to account in cultivation, since by earthing up the stems a larger yield of roots would probably be ensured.

In testing aconite root by taste it must be remembered that the tingling sensation is often not developed for ten minutes and lasts for two or three hours, so that half a day must be allowed to elapse before tasting a second sample, to prevent the chance of confounding the effect of one root with that of the next.

In conclusion, aconite is very easy of cultivation, and considering the small quantity used, there is no reason why any chemist who has a small piece of garden should not grow his own aconite root.

The President, in proposing a vote of thanks to Mr. Holmes, which was carried unanimously, said his suggestions with regard to drugs were always acceptable, and these now given would doubtless have full consideration.

The next paper read was on—

AMMONIATED EXTRACT OF ERGOT, AND A PROCESS FOR ITS PREPARATION.

By A. W. Gerrard, F.C.S.

For ten years or more I have known a preparation bearing the above name; how long before this it had been in use or to whom it owes its origin, I can give no information.

My earliest practical acquaintance with this extract dates some five years back, about which time I was asked by one of the then obstetric assistants to University College Hospital to prepare some for him, as he wished to try it, having seen it used successfully in a general practice. In the absence of any published or private formula to guide me, it was left to my discretion to follow such a process as I thought best suited for the object in view.

I premised at starting my experiments, that the preparation to have any good right to the name it bears should have ammonia employed in some form or other as the solvent of the extractive matters of the ergot, and not that the ammonia be merely added

after an aqueous extract had been made. For this purpose the solvents that appeared most available and worthy of trial were aromatic spirit of ammonia, and solution of ammonia.

From a first consideration of the requirements of the case it seemed easy to frame a process that ought to give a satisfactory result, but practice proved the contrary. No difficulty was experienced in producing an active therapeutic agent, but a good deal of trouble had to be taken before an elegant or presentable pharmaceutical preparation resulted.

Experiments with Aromatic Spirit of Ammonia as the Solvent.

First experiment.—Ten ounces of well crushed ergot was moistened quickly with the spirit and packed in an air-tight percolator, more of the spirit was added till 10 ounces was reached. Percolation proceeded very slowly, in twenty-four hours less than 1 ounce of percolate had passed; displacement was now resorted to by means of water, but the process went on so slowly that after four days only 5 ounces of percolate was obtained, meantime the displacing column of water had become strongly alkaline from the diffusion into it of the ammonia. The experiment was stopped.

Second experiment.—The same quantity of ergot was employed, but it was packed looser in the percolator, and 20 ounces of the aromatic spirit poured over it in several portions; percolation was still slow, but more rapid than in the first experiment; 9 ounces of percolate was obtained, very high coloured and rich in extractive; on attempting to displace the remainder of the spirit the same difficulty arose as in experiment No. 1.

If the second experiment had been successful, I intended to have followed a process of repercolation, but the difficulty of displacement, and consequent waste of material, made it evident that the process would not answer. Therefore no further experiments were undertaken with this solvent.

Experiments with Ammonia Water as the Solvent.

First experiment.—Ten ounces of crushed ergot was treated with 50 ounces of water to which 1 per cent. of strong solution of ammonia had been added; on contact of the ergot and ammonia a marked deepening of colour to a purple was observable, this being the usual reaction of alkalies upon the colouring matter of ergot, at the same time an almost immediate softening of the drug is apparent, it being evident that water in the presence of the alkali rapidly penetrates its tissues. This action as compared with that

of water alone is very marked, and although it produces a rapid removal of the extractive, it exercises an influence detrimental to percolation; the ergot swelling and softening so much as to assume a half colloid state, unsuited for the filtration of the solvent. Under these conditions the exhaustion of the ergot was so slow as to make it evident that the ammonia was present in excess and a weaker solution should be tried.

Second experiment.—The same process was repeated as in the last experiment, using a $\frac{1}{2}$ per cent. solution of strong liquor ammoniæ. Here the action was similar to that described in the last experiment, but much less in degree, and not enough to prevent percolation proceeding in a satisfactory manner. Thus the exhaustion of the ergot by means of an ammoniacal solvent was accomplished, and after a few further experiments the following formula was formed:—

Formula for Ammoniacal Extract of Ergot.

Take 10 parts of crushed ergot, macerate it for eight or ten hours with frequent stirring in 50 parts of cold water, containing $\frac{1}{2}$ per cent. of strong solution of ammonia; then throw it upon a flannel strainer, and allow it to filter. Wash the ergot from time to time with more ammoniacal water till sufficiently exhausted. The filtrate, which is somewhat turbid, is evaporated to 5 parts, any scum or fat rising to the surface being carefully removed. The extract when cool is treated with an equal volume of aromatic spirit of ammonia, and the product set aside until subsidence is complete; the clear portion is then decanted and the residue filtered through felt or flannel, washing the deposit with a little more spirit, so as to bring the volume of the extract to 10, 1 part fluid thus containing the soluble matter of 1 part solid of ergot.

In appearance this extract is much darker in colour than the ordinary form, the odour is mainly ammoniacal, and the average specific gravity 1000.

A sample I have kept for nearly a year does not appear to have undergone any change. The dose is the same as the ordinary liquid extract.

In studying the above process, it may strike some observers as somewhat curious to use ammonia as a solvent, and then to dissipate it by evaporation; but it must be remembered that the ammonia is not eliminated until its work has been accomplished, and what therapeutic action it might have exerted is compensated for by the addition of the aromatic spirit.

In the process of manufacture, whilst evaporation is proceeding, it

will be noticed that not only albumen and colouring matter separate, but a considerable quantity of oil. The presence of this oil is accounted for by the formation of a soap between the ammonia and ergot fat during maceration, the soap remaining in solution whilst cold, but being decomposed by heat.

This extract, as regards its therapeutic value, has had a thorough trial in the obstetric department of University College Hospital, and has given general satisfaction, Dr. John Williams, one of the obstetric physicians, having requested it to be substituted for the ordinary extract in such mixtures as contain ergot.

To enter into a discussion as to why ammonia improves or increases the action of this drug is scarcely within the domain of pharmacy, and published therapeutic memoranda on this point are wanting. From inquiries I have made, it appears, as the result of numerous observations, that the ammonia develops a rapid action of the drug by acting as a nervine stimulant, which action is very useful during that period when the patient has to undergo that painful and trying ordeal for which ergot is so extensively employed. To this must be added the great solvent power of the ammonia, which ensures a most complete exhaustion of the active principles of the drug.

The PRESIDENT proposed a vote of thanks to Mr. Gerrard, which was carried. He said he was glad to find that Mr. Gerrard had had the courage to publish his failures as well as his successes, as such a course rendered a paper far more useful to future investigators. Their knowledge of the shoals of the sea of pharmacy, as well as of its depths, could not be too thorough.

Mr. STUART asked whether it was not possible, with so small an amount of ammonia, that the whole of it might form a soap with the oil, and hence be neutralised, and whether an equally good result would not be obtained from a simple aqueous extract. He understood this was a superior preparation to that of the British Pharmacopœia, and he believed that in many quarters amongst medical men the British Pharmacopœia formula had for obstetric purposes fallen into discredit. If this ammonia process were a good one it would be a distinct gain to pharmacy and to the medical profession. In the United States Pharmacopœia, since 1860, an acid extract of ergot had been used. Dr. Squibb was one of the originators of the process which included the maceration of the ergot with dilute alcohol in which there was a little acetic acid.

He noticed in the report which the President read as to the proof sheets of the new Pharmacopœia that that acid was now exchanged for hydrochloric acid, but the Committee still adhered to the acid preparation, and in his experience, having made from the original formula large quantities of the preparation of ergot, that was immensely superior to the British Pharmacopœia process. It was a curious thing that apparently both an alkaline and an acid preparation should produce good results, but the chemistry of ergot was, notwithstanding all the investigation which had taken place, still in an undecided state.

The PRESIDENT remarked that in the formula of the United States Pharmacopœia now being issued, not only was hydrochloric acid substituted for acetic acid, but the glycerine formerly used was omitted.

Mr. STUART thought from his experience that that would be an improvement.

Dr. SYMES said all these investigations tended to show that water was really capable of extracting the active principle of ergot. He thought it had scarcely ever been questioned that the formula of the British Pharmacopœia really worked admirably. He did not understand Mr. Gerrard to claim that this was a superior preparation, but what he found was that certain ammoniated preparations were put forward by certain houses as being the original, the only genuine, and all that kind of thing; that they varied considerably in appearance from very pale sherry to a dark blackish colour; that he with many others had been rather surprised that all should be the original and the best, and had, therefore investigated the subject. They were much indebted to him for so doing. He certainly thought in using the small quantity of ammonia that he did it was quite possible that a soap was formed, but that would only have the effect of removing a certain amount of oil from the ergot, and enable the water to act more freely than it otherwise would do; he would probably have alkaline soap acting in the ergot.

Mr. MARTINDALE said he had been asked to make an ammoniated preparation of ergot for a medical practitioner, who told him that he had some which was much more active than he had ever been supplied with according to the British Pharmacopœia. That was eight or nine years ago, and since that he had continued to make a very satisfactory preparation. He could quite corroborate what Mr. Gerrard said, that ammonia, either in an aqueous or somewhat mixed aqueous and alcoholic solution, had a powerful action in

abstracting the active properties of ergot, making a strong dark brown solution immediately, but he thought Mr. Gerrard's process was a little too complicated. He did not adopt anything like so complicated a process; he used about equal parts of spirit and water mixed with one-eighth of solution of ammonia, which he percolated through the ergot in fine powder. The first product was set aside, the latter product evaporated to a certain small bulk, and then mixed with the other. He thought it was better to use an ammoniacal preparation of this kind rather than the one made with sal volatile, as given in the new London Hospital Pharmacopœia. There the ergot was treated first with sal volatile, and after percolation to a certain extent the first product was set aside and the marc treated with so much water heated up to 160° F., so that it proceeded somewhat on the lines of the British Pharmacopœia process; this second product on evaporation was added to the percolated portion. There was no question that ammonia was a very powerful solvent, much greater than simple water, of the active properties of ergot. He had made a preparation according to the American Pharmacopœia, and the acetic acid solution there had undoubtedly a similar action to the ammonia in the process now described. He certainly did not think the British Pharmacopœia process was a good one; it never yielded really good results in his hands.

Mr. PARKER thought that in the present state of knowledge of the chemistry of ergot, they were working somewhat in the dark in devising formulæ for its preparations. It was not known upon what exact constituent the activity of ergot depended, and therefore, they could not work out a process based on their knowledge of its chemistry. That being the case, before drawing any conclusions as to whether simply an aqueous, an acid, or an alkaline extract was best, they should start with a certainty as to the quality of the drug operated upon. Many drugs, ergot and cantharides especially, varied very much in quality, according to the manner in which they were collected and stored. A good sample of ergot, after being kept some time, unless very carefully kept, might be entirely deteriorated; therefore, the first thing to do would be to prove the activity of a sample of ergot; then from the same sample prepare a aqueous, an acid, and an alkaline extract, and have them submitted to a comparative therapeutical examination.

Mr. GREENISH said he felt every much indebted to Mr. Gerrard for bringing this subject before the Conference, and if the amended preparation of ergot was not medicinally more active, which he was disposed to question, at least, the paper possessed considerable

interest from the fact that this had hitherto been regarded as a secret preparation. He was not at all prepared to accept the statement that this preparation was better than that of the British Pharmacopœia. He recollected that Blumberg, who had paid great attention to ergot, had stated distinctly that water was quite sufficient to extract the active principles. Now, if a man like that, who had paid perhaps greater attention than any one else to ergot and to the isolation of its active principles, had arrived at that conclusion, he thought they were justified in adopting it. Professor Dragendorff, who had also paid great attention to the subject, found that water was quite sufficient to extract the active principles. He should like to have heard from Mr. Gerrard the results of some comparative trials by medical men of the two preparations, and he suggested that in experimenting upon ergot he should extract the fat from it previous to applying any menstruum.

Mr. Hampson said they were all much obliged to Mr. Gerrard for the formula he had given, because they wanted one to satisfy the demands of their medical friends, but he very much doubted if it were really any improvement on the former preparations. He could speak from direct knowledge of the efficacy of the British Pharmacopœia preparation in an institution with which he was acquainted, where that preparation, well prepared, was used and was always satisfactory.

Mr. Martindale said no doubt water in itself was a good solvent, but the disadvantage was so much of it was required; the amended preparation could be prepared with very much less bulk and without having to evaporate it down for such a length of time.

Mr. Plowman said there was one more point in connection with ergot which must be borne in mind; in the British Pharmacopœia process the oil was extracted with ether and rejected. Now, it was not proved by any means that that oil was inert, and so late as 1881 a paper was published in which, amongst other things, it was said to "constringe the blood vessels," and it was possible that a hydrochloric solution might extract the principle which was, by the British Pharmacopœia process, taken out by the ether and rejected. In Mr. Gerrard's process, in which a scum was formed which was skimmed off, some of the active principles might be withdrawn. He should like to know whether that had been rejected definitely without any experiment being tried to ascertain if it possessed any activity.

Mr. Schacht thought this question had been answered very elaborately during the last few years by a French authority. Two

memoirs of considerable detail had been published by two different medical authorities about the various properties and powers of the different principles of ergot. In the one he remembered perfectly well that very considerable remedial power was attributed to this oily constituent of ergot, whilst a later writer on the subject contradicted almost word for word the opinions expressed by the previous chemist on that point. He thought Mr. Parker was right in his caution about elaborating processes too carefully until they had more knowledge about the chemistry of ergot and the therapeutical value of the particular ingredients capable of being separated from it. He might also venture to remind the meeting how carefully the late Mr. Stoddart had at one time worked, not only on this subject, but on the ergots of grasses generally, and then he found that even such principles as he was able to detect generally in them varied according to the time at which they were gathered. Many other points of interest had still to be cleared up before they could attach too much value to any particular suggestion with regard to these preparations.

Professor QUINLAN said it was a constant habit with medical men, particularly in obstetric practice, when using ergot to add to it a small quantity of ammonia. It was a well-known fact, which any one could prove for himself, that ergot had the power of diminishing the tension in the capillary blood vessels, whilst ammonia had the contrary effect; therefore, a little quantity of ammonia was found to have a useful corrective effect in the exhibition of large doses of ergot.

Mr. GERRARD said it would be an answer to many inquirers if he stated at once that he did not claim for this preparation any activity beyond that of the liquid extract of the British Pharmacopœia. But the addition of ammonia appeared in some way to assist the activity or improve the action of the ergot. Those who used it gave it the preference, and every observation went to confirm this fact. Professor Quinlan had also corroborated that the addition of ammonia to a preparation of ergot, whether prepared first by simple aqueous extraction, or by ammoniacal extraction, did improve its action, probably by the fact that it was simply an adjunct and a stimulant. Mr. Stuart had referred to the use of acidulated water as a solvent for ergot preparations. He had no doubt that acidulated water was as good a solvent as water itself, or ammoniacal water, but it was a much slower solvent; by adding acid to water containing any albuminous principles, the passage of the water through the tissue was retarded. But the addition of alkali,

on the contrary, caused a rapid penetration of those tissues, and that was just what took place here. It might be, too, that ammonia acted in some way to eliminate them and make them more soluble. It might be that it formed a combination with what had been called the active principle of ergot, sclerotic acid, although he did not himself look upon that as a definite substance. Mr. Martindale's process was similar to the one he had tried of using aromatic spirits of ammonia as a solvent, but practically he found that exceedingly difficult to work; he could not obtain a good process, there was considerable waste. The process of displacement was not practicable; there would take place a diffusion of the ammonia into the water used for displacement, and thus there was a loss, not only of ammonia, but of the solvent and some of the ergot principles. There was this to be said, that if it could be carried out successfully, in such a preparation there would be present not only the soluble extractive matter of the ergot, but also the ergot fats, in the form of ammoniacal soap, and if those ergot fats did play any part in the action of the drug, it would be an advantage, though according to the experiments mentioned by Mr. Schacht that appeared to be doubtful.

The next paper read was on—

TUMEFACTION AS AN AID IN THE IDENTIFICATION OF THE VARIETIES OF MARANTA AND OTHER STARCHES.

By W. H. Symons, F.R.M.S., F.C.S.

It has been shown by different investigators that Bermuda, Natal, and St. Vincent arrowroots require for their tumefaction water of varying temperature. Since these starches are probably identical in chemical composition, it follows that this behaviour must be due to some physical cause, most likely the greater or lesser density of the integuments. Seeing this, I was led to infer that any reagent which affects starch in the same way as hot water ought also to yield comparatively the same results.

Several reagents were accordingly tried. The caustic alkalies being found the most powerful and uniform in their action were chosen for further experiments. Solutions varying from 0·5 to 1·5 per cent. of chemically pure caustic soda were prepared, and 1 c.c. of each strength solution placed in a small vessel; to every vessel was added ·1 gram of the starch to be examined. The mixtures

were well stirred at intervals for ten minutes, after which they were examined under the microscope.

The following precautions were observed. The starches compared were examined side by side. The alkaline solutions were of known strength, freshly prepared, exposed as little as possible to the air, and on no account allowed to evaporate when mixed with the starch. A constant proportion of starch and solution was used, it having been ascertained that if a small quantity of the solution burst any of the granules, a larger quantity would burst all.

From these numerous precautions it may be thought that this process is much more tedious than merely placing starch in water of a known temperature; but in practice it is not so, quite as much care being necessary in the latter case as in the former, and a larger quantity of starch is required.

The results are tabulated to show the strength of the solutions which respectively tumefied, 1st, a few granules; 2nd, the majority of the granules; and 3rd, all the granules. The numerals in the left-hand columns show the order which the starches would take, if arranged according to size. A table showing tumefaction by heat is also given (see page 470).

With the exception of the oat and cassava starches, the starches in both lists will be seen to be arranged in nearly the same order. The oat starch under the microscope appears clean, but with the caustic soda it forms a yellow paste, indicative of gluten, which does not interfere with the action of the alkali, but does with that of hot water.

In a paper published in the first number of the present volume of the *Pharmaceutical Journal*, I pointed out the striking relation which exists between the temperatures under which the starch grew and its tumefying point. "The higher that temperature, the higher the point of tumefaction," but I said "cassava and oat starch are exceptions." However, using the alkaline method of tumefaction, these starches are also seen to bear this relation. The reason why oat starch does this has been given above, but why cassava starch should behave differently to hot water and the alkali I do not know; it was tried repeatedly with both reagents, and always with the same result.

Instances are on record of analysts having certified pure maranta and other starches as adulterated, where, subsequently, more competent microscopists have proved the starches assailed to be genuine, although not until the accused retailer had suffered considerable annoyance and been put to great expense to defend his case. This,

Tumefaction by Caustic Soda.

Order of Size.	Starch.	Per cent. Solution. A few Swollen.	Majority Swollen.	All Swollen.
2	Potato	·6	·7	·8
8	Oat	·6	·8	1·0
4	Natal	·7	·8	1·0
1	Tous-les-mois	·7	·9	1·0
5	Wheat	·7	·9	1·0
4	Bermuda	·8	·9	1·1
3	Sago	·8	·9	1·1
6	Maize	·8	1·0	1·1
7	Cassava	·8	1·0	1·1
4	St. Vincent	·9	1·0	1·2
9	Rice	1·0	1·1	1·3

Tumefaction by Heat.

Order of Size.	Starch.	A few Swollen.	Majority Swollen.	All Swollen.
2	Potato	55° C.	60° C.	65° C.
7	Cassava	58° C.	63° C.	68° C.
4	Natal	58° C.	65° C.	70° C.
5	Wheat	60° C.	65° C.	70° C,
1	Tous-les-mois	65° C.	68° C.	72° C.
4	Bermuda	62° C.	69° C.	73° C.
3	Sago	64° C.	68° C.	74° C.
6	Maize	65° C.	70° C.	77° C.
8	Oat	65° C.	70° C.	77° C.
4	St. Vincent	66° C.	73° C.	77° C.
9	Rice	70° C.	75° C.	80° C.

I think, proves that, in some instances, it needs more time to practise the microscopical identification of the starches than the analyst is able to devote to that branch of his studies. Therefore any chemical test which comes to the aid of the microscope in such cases must prove useful. The tumefaction of starch by the above process needs no special practice, yet affords additional data, and hence may, I trust, fulfil the condition mentioned above.

The President, in proposing a vote of thanks to Mr. Symons, said he had put a new method into the hands of workers in pure science and applied science, and one by which they might confirm the results obtained by other methods. He was sure, for this last

addition to his work on the starches, the Conference would accord him a vote of thanks.

Mr. GREENISH could not allow this paper to pass without one or two observations. They were much indebted to Mr. Symons for giving them any assistance in determining the kind of starch they were examining, in addition to the microscope. Starch was almost universally diffused in nature, but in using the microscope for determining its presence, they found it very often where they did not expect to find it, and where really it had no business to be; whilst in other cases, when a particular kind of starch ought to be present, some other was detected. Starches being so widely distributed, any means by which they could be determined should be welcomed by pharmacists. Mr. Symons had confirmed some investigations of his own with regard to Bermuda, St. Vincent, and Natal arrowroot. Several years ago some maranta grown in Natal was pronounced by many public analysts to be potato starch, and it presented a considerable resemblance to it, but a good microscopist could determine the difference. There was, however, a great difference between maranta grown in Natal, and that in Bermuda or St. Vincent. The reason of this he could not explain, but such was the case. He was not sure that this method would be of very much service without the microscope, on which he should prefer to rely, and in the examination of starch he thought it was desirable to use one particular power, and adhere to that power for all starches. The relative sizes of the starch grains were of great importance, and these could best be determined by an educated eye, using one particular power. He also found that if the medium in which the starch is examined be coloured, it assisted the observer; and in addition to the microscope, the polarizer might be used to advantage.

Mr. SYMONS said he did not put forward this method as superseding the microscope, but by this means it was quite possible to distinguish between Natal arrowroot and potato starch. If Natal arrowroot were mixed with ten times its weight of ·8 solution of caustic soda, it would only be partially tumefied; if it were potato starch, it would tumefy completely. It took a 1 per cent. solution to tumefy Natal arrowroot to the same extent.

A paper was then read on—

THE PURITY OF COMMERCIAL CHLORIDE OF GOLD.

By F. W. Branson.

In the Blue List issued annually to members of the British Pharmaceutical Conference, "The Purity of Commercial Salts of Gold" has, for several years past, appeared as a desirable subject for investigation; the contribution of the results of a series of recent analyses of chloride of gold may therefore prove of interest, especially as most pharmacists have at least occasional transactions in this article of commerce.

A standard of strength and the maintenance of this standard is by no means a matter of indifference, considering the large quantity used by photographers in the process of toning. As most of the salt met with in commerce is found in 15-grain tubes, ten of these from five distinct sources were taken for analysis, low results being obtained from Nos. 9 and 10; two other tubes from the same source were taken to prove whether the deficiency was an average one, or due to careless weighing or loss in filling.

In the above series, owing to the distinctive appearance of the various samples, labels, etc., the products of four manufacturers, could be recognised, series *A*, *B*, *C*, and *D*.

After several experiments, the following methods for the estimation of the weight of contents of tube and the contained gold were found to be convenient, rapid (if the time required for precipitation, thirty-six hours, be excepted) and accurate, the precipitated gold being nearly chemically pure.

The vol. process with oxalic acid and permanganate, as described by Sutton, was not tried, the direct method being considered preferable.

The actual weight of the contents of each tube was estimated as follows:—After removal of label by soaking in water, the tube was filed round the centre to facilitate breakage; the weight of tube with contents was next taken, the salt shaken to one end of the tube and fracture made at filed portion; the two portions of tube with contents were now transferred to a beaker, and treated with successive quantities of distilled water; the resulting solution, after transference to a conical flask having a file-mark at 5-oz. capacity (which measure the solution should occupy) was precipitated with oxalic acid.

The weight of fractured tube after drying was deducted from the weight of tube with contents, the difference being chloride of gold.

The annexed series shows the weight found in each tube, the average of each manufacturer is also given.

Sources		
A .	14·781 14·180 14·875 15·995	average 14·957
B .	15·620 14·673	average 15·146.
C .	14·627 15·470	average 15·058.
D .	13·547 13·948 13·825 13·677	average 13·749.

The best precipitant was found to be pure oxalic acid, several advantages being apparent; for, as the precipitation proceeds at a much slower rate than with either sulphurous acid or ferrous sulphate, should platinum or other metals be present, they are less likely to be carried down with the gold; the metal is also thrown out of solution in a more coherent form, thus facilitating the subsequent operations. The non-introduction of a metallic salt is also obviously an advantage if the separation of metals is found requisite.

Experiments proved the time required for complete precipitation to be not less than thirty-six hours at a temperature of about 70° F., and twelve hours exposure to light.

The quantity of oxalic acid found to give good results was 25 c.c. of the standard solution (63 in 1000) for the contents of each tube; this quantity was therefore measured by means of a pipette into the gold solution, the flask set aside under conditions as above described, and the contents finally raised to boiling point; after subsidence the colourless solution was found in a trial experiment to be not darkened by H_2S, and on evaporation no further reduction of metal occurred, the residue, oxalic acid, being quite white.

After precipitation the greater part of the fluid was poured on a filter, the flask was then shaken in a circular manner, so as to cause the particles of gold to sweep off any film adherent to the sides of flask, which should now appear by reflected light to be quite free from metallic coating, the precipitated metal collected on the filter, washed, dried, incinerated, and weighed, the following results being obtained :—

A . $\left\{\begin{matrix} 7·267 \\ 6·974 \\ 7·313 \\ 7·792 \end{matrix}\right\}$ average 7·286.

B . $\left\{\begin{matrix} 7·349 \\ 7·082 \end{matrix}\right\}$ average 7·215

C . $\left\{\begin{matrix} 7·097 \\ 7·537 \end{matrix}\right\}$ average 7·317.

D . $\left\{\begin{matrix} 6·595 \\ 6·773 \\ 6·661 \\ 6·588 \end{matrix}\right\}$ average 6·654.

Sufficient time not being at my disposal for the complete examination of the residues from the evaporation and incineration of the oxalic acid solution from which the gold had been precipitated, they were placed aside for subsequent analysis. I will now, therefore, merely give in round numbers the weights yielded by series *A*, *B*, *C*, and *D*.

A and *B* more than 10 per cent.
C and *D* less than 1 „

Metals precipitated by H_2S or Am H S were practically absent from all the above samples, which were obtained from firms most likely to supply the requirements of pharmacists, foreign samples being purposely excluded.

A small variation *plus* or *minus* within reasonable limits in the quantity of salt or metal contained by any given tube is, of course, allowable, and is to be expected, but the marked deficiency of tubes Nos. 9 to 12, inclusive, obtained from a firm possessing the confidence of the trade, demands notice, for a deficiency of 8 per cent. in weight of contents, or 5 per cent. in the proportion of metal that should be present demands notice, and it should be mentioned that neither trade mark, seller's name, nor guarantee label was attached to either of these numbers; but tubes Nos. 1 to 8 all had attached one or other of these distinctive marks, and from sources *A* and *B* 7 grains of gold was guaranteed, which quantity was fully present, as proved by analysis.

In a paper by my friend, Mr. Richard Reynolds (*vide Pharm. Journ.*, [2], vol. ii.), greater discrepancies than the above were detailed, and the proposal was then made that the commercial value of the article should be governed by the equivalent of gold present. Now, as then, this desirable practice would, if generally followed, certainly tend in favour of the interest of the consumer, and probably for this very reason is not adopted by some manufacturers.

The PRESIDENT proposed a vote of thanks to Mr. Branson, which was carried.

Mr. HAMPSON asked if it would be any advantage to have the solution sold by measure.

Mr. BRANSON said there was the question of convenience of transport involved, as the tubes were frequently sent by post; but there was no reason why a strong solution of definite strength should not be sent out in capsules.

This was followed by a paper on—

THE IODIDES OF BISMUTH.

BY F. W. FLETCHER, F.C.S., AND H. P. COOPER, F.C.S.

The iodides of bismuth described in the text-books are two, viz., a black tri-iodide ($Bi\,I_3$) and a red oxy-iodide ($Bi\,O\,I$).

To obtain the former, one equivalent of tri-sulphide of bismuth is directed to be heated with three equivalents of iodine in a capacious, loosely-covered glass globe. The iodine turns out the sulphur, and the new compound is deposited on the sides of the vessel in the form of brilliant plates. This is Schneider's process. Another method, suggested by Weber, consists in throwing iodine into melted bismuth, and distilling the mixture out of contact with air.

The red oxysalt ($Bi\,O\,I$) is said to be formed on heating the tri-iodide for some time in a crucible, when it collects below the surface of the crystallized iodide in a mass of copper-coloured rhombic laminæ.

Both of these compounds, however, may be much more conveniently obtained by the decomposition, under certain conditions, of a solution of a bismuth salt by means of a soluble iodide.

Mr. Pattison Muir, to whom, with his coadjutors, chemists are immensely indebted for researches upon bismuth compounds, has recently described a very striking method of exhibiting the formation of the two iodides by pouring a solution of the tri-iodide of bismuth in hydriodic acid into varying quantities of water at different temperatures. On adding the hydriodic acid solution of $Bi\,I_3$ to a little cold water, the black tri-iodide is thrown down; whilst if a large bulk of hot water is employed, red crystalline $Bi\,O\,I$ is produced.

We have lately met with a yellow iodide of bismuth, which, partly on account of its novelty, and largely on account of its bearing

upon one of the Pharmacopœia tests for the purity of bismuth salts, we considered would be of sufficient interest to bring before the Conference.

In the course of testing a number of samples of metallic bismuth for lead, by the addition of dilute sulphuric acid to the solution of the metal in nitric acid, we observed in one instance that a very considerable deposit was formed after standing for about twenty-four hours. As this appeared to indicate the presence of a very much larger proportion of lead than we had previously met with, the precipitate was collected upon a filter, washed, and treated with solution of ammonium acetate, in which it dissolved. Upon the addition of potassium iodide to the liquid, a bright yellow precipitate was thrown down, having all the appearance of lead iodide.

A duplicate experiment being made, we found to our surprise that no precipitate was in this instance formed, when the solution of bismuth was treated with sulphuric acid; and the subsequent application of Chapuis and Lennoissier's potassium chromate test * conclusively proved the absence of lead in the sample of bismuth.

It occurred to us, on reflection, that the precipitate produced by sulphuric acid was probably a very basic sulphate of bismuth, produced owing to the bismuth solution being too concentrated. Experiment verified this assumption; and it may not be out of place here to mention that we find that if subnitrate or carbonate of bismuth,—free from lead,—be dissolved to saturation in nitric acid, diluted with half its volume of distilled water, as directed in the Pharmacopœia, and an equal bulk of dilute sulphuric acid then added, a precipitate of basic sulphate of bismuth is formed on standing, which, so far as the Pharmacopœia test goes, might reasonably be mistaken for sulphate of lead.

The solubility of freshly precipitated basic, or rather sesquibasic, sulphate of bismuth in ammonium acetate solution, has not we believe, been previously noted, and it was therefore quite accidentally that we discovered the yellow iodide, which is the occasion of the present paper.

It naturally occurred to us that the yellow precipitate might not be an iodide of bismuth only, but a double iodide of bismuth and potassium. To ascertain this, a portion was treated with nitric acid and excess of ammonia. The filtered liquid evaporated to dryness left no residue on ignition.

The absence of potassium was therefore demonstrated.

* *Journ. Chem. Soc.*, xxxvi. 80.

We were now anxious to ascertain by what other methods the new compound could be obtained.

Being aware that Drs. Woodman and Tidy had some years since, in the *British Medical Journal*,* described the formation of a red precipitate in a mixture containing iodide of potassium and subnitrate of bismuth, and also that M. Jaillet had prepared various yellow compounds under somewhat similar conditions,† we proceeded to treat various samples of subnitrate of bismuth with iodide of potassium, and found that the products obtained varied in colour from a pale lemon-yellow to a deep orange-red. Knowing that subnitrate of bismuth varies considerably in its percentage of nitric acid, we inferred that in the absence of the latter the yellow salt would be alone produced. The samples of subnitrate were therefore first shaken with solution of ammonium or sodium acetate, in order that acetic might take the place of any free nitric acid that might be developed. The addition of K I to these mixtures formed the yellow iodide only, as we anticipated.

We found also that the iodide could be readily prepared by pouring a very dilute solution of nitrate of bismuth into mixed solutions of potassium iodide and sodium acetate. Liq. bismuthi, B.P., whether neutral or acid, gives no precipitate with potassium iodide, but an orange solution is formed. This, in fact, is the method recommended by Thresh, for preparing Dragendorff's reagent. If, however, scales of citrate of bismuth and ammonia are dissolved in water, and the solution acidified with acetic acid, a copious orange-yellow precipitate is formed on the addition of potassium iodide.

Yellow iodide of bismuth is sparingly soluble in acetic, and freely in hydrochloric acid. Sulphuric and nitric acids liberate iodine. Digested with zinc and dilute sulphuric acid, the bismuth is deposited as metal, and the iodine passes into solution as iodide of zinc.

It is not decomposed by water, even at a boiling temperature. Ignited in a porcelain crucible, it first blackens, and then evolves iodine, leaving a residue of bismuthous oxide, which, however, obstinately retains traces of iodine, which are only expelled after prolonged heating.

We have made a large number of analyses of different samples prepared by various methods, and we find that the relative proportions of bismuth and iodine vary with the colour of the compound,

* See *Pharm. Journ.*, [3], i. 464.

† *Pharm. Journ.*, [3], vol. xi. 1063.

those which are yellow containing more bismuth and less iodine than those which are orange or orange-red.

Analyses of several specimens of a fine lemon-yellow colour, prepared by treating equal weights of subnitrate of bismuth with similar quantities of sodium acetate and potassium iodide, gave concordant results. The bismuth was estimated by the two following methods and the results given represent the mean of several experiments.

1. By ignition, the precaution being taken to moisten the residue with nitric acid, and again ignite before weighing. $Bi_2 O_3$ found = 86·6 per cent.

2. By solution in dilute nitric acid and precipitation with ammonia. The precipitate washed until free from any trace of iodide, yielded on ignition 86·8 per cent. $Bi_2 O_3$.

The iodine was also estimated by two methods:—

1. The compound was heated with solution of pure sodium hydrate, the precipitated bismuth hydrate thoroughly washed, the filtrate and washings acidified by nitric acid, and the iodine precipitated as a silver salt. The amount found was 11·35 per cent. A trace of iodine was, however, discoverable in the precipitated bismuth, even after prolonged washing.

2. Known weights of bismuth subnitrate and potassium iodide were agitated with water in the presence of sodium acetate, and the yellow iodide obtained filtered off, washed, dried and weighed. The filtrate and washings were then diluted to a certain volume and the iodine estimated by volumetric solution of silver nitrate. It was found that 12·8 per cent. had been absorbed in the formation of the yellow compound.

An attempt was made to separate the iodine in the form of HI by decomposing the iodide by a current of H_2S, but this was not successful, the resulting black precipitate being found to contain iodine in abundance.

The results obtained tend to show that the yellow compound is a very basic iodide of bismuth, represented by the formula—

$$Bi I_3, 5 Bi_2 O_3 \text{ or } 3 Bi O I, 4 Bi_2 O_3.$$

This formula requires 12·9 per cent. of iodine and 87·7 per cent. of $Bi_2 O_3$. The amount of the latter found by experiment was 86·7 per cent. and the iodine (calculated by difference) 12·8 per cent.

The formula of the tri-iodide of bismuth being $Bi I_3$ and that of the oxy-iodide or bismuthyl iodide ($Bi O I$), the latter may be

regarded as formed from 1 molecule of $Bi\,I_3$ and 1 molecule $Bi_2\,O_3$, thus—

$$Bi\,I_3 + Bi_2\,O_3 = 3\,Bi\,O\,I.$$

Between the latter and the yellow soap which we have described, it is probable that there may be many intermediate compounds, a supposition confirmed by the fact that iodides of various shades of colour, from pale yellow to deep orange-red, are easily obtainable by altering the relative proportions of the iodine and bismuth. A striking experiment illustrating the tendency of the tri-iodide to form oxygen compounds may be shown by dropping a few grains of $Bi\,I_3$, or a few drops of the solution of the latter in hydriodic acid, into a large bulk of water, the latter at the same time being vigorously shaken. The brownish black colour of the tri-iodide is seen to give place to a white turbidity, and on the careful addition of a little more of the powder or solution the formation of the yellow iodide is at once apparent.

The PRESIDENT, in proposing a vote of thanks to the authors of the paper, said it was one of considerable theoretical as well as practical value.

Professor TICHBORNE asked if Mr. Fletcher found the temperature at which the salt was precipitated affected its composition, as temperature was known to have a great influence on basic salts generally.

Mr. FLETCHER said the temperature seemed to have no action at all. The salt was not soluble in either cold or boiling water; this would instantly distinguish it from iodide of lead.

Mr. PLOWMAN then read the following:—

NOTE ON MICROSCOPIC ORGANISMS IN CERTAIN ORGANIC SOLUTIONS.

BY C. H. BOTHAMLEY, F.C.S.,

Assistant Lecturer on Chemistry at the Yorkshire College.

The growth of algæ and fungi in solutions of organic substances, as for example, in solutions of tartaric acid or potassium acetate, is a matter of common observation. A number of such forms were described and figured by Pereira many years ago (*Pharm. Journ.*, vii., pp. 337, 370, 426, 1847–48). Not only do they grow in purely

organic solutions, but also in organic solutions containing a considerable proportion of metallic salts. Kützing observed the formation of such growths in solutions of "polychrome" (æsculin) mixed respectively with ferric chloride, cupric sulphate, tartar emetic, gold chloride and stannous chloride. Several of the forms which grow under these conditions are described by Pereira (*loc. cit.*), who also states that he had himself observed the growth of a filamentous plant in a solution which was used for the preservation of animal substances, and which contained mercuric chloride. The exact nature of the growth depends on the particular metallic salt present, each salt being favourable to the development of a particular species. In the same paper, Pereira states that he had observed the formation of similar growths in a solution of phosphoric acid prepared by oxidizing phosphorus with nitric acid, and also in a solution of arsenious acid! It is well known, too, that a very singular fungus grows in the cells of Daniell's battery, if allowed to remain unused and at rest for a long time. With these exceptions, however, the formation of such growths in inorganic solutions appears to be comparatively rare.

In the College laboratory we are troubled with the continual formation of a green vegetable growth in bottles containing respectively solutions of ordinary sodium phosphate, magnesium sulphate, and calcium sulphate, though no such growths are formed in solutions of ammonium salts, barium chloride, and other reagents standing on the same shelves. It was natural to suppose that the germs of these organisms are derived from the air, but their appearance only in the three reagents mentioned, and not in any of the others, although some of the latter seemed to constitute more favourable media, led to the supposition that the germs were possibly mixed with the particular salts. Experiments were therefore made to determine this point.

Ten per cent. solutions of magnesium sulphate and sodium phosphate respectively were prepared by dissolving the salt in cold recently distilled water, and portions of these solutions were placed in small flasks, as follows:—

A. Original solution, left exposed to air.

B. Solution boiled five minutes, then left exposed.

C. Solution boiled five minutes and flask plugged with cotton-wool.

D. Solution heated at 55–60° C. for two hours, then plugged.

E. Solution heated at 70–75° C. for two hours, then plugged.

For some time no growths made their appearance in any of the

flasks, but soon after the air of the balance room in which the flasks were placed had been rendered dusty, in consequence of sweeping, the vegetable growth began to form in the exposed flasks *A* and *B*, and gradually increased. In one of the *B* flasks, containing magnesium sulphate, there was also a greyish flocculent growth. No growth appeared in any of the plugged flasks, even after fifteen months. It is evident, therefore, that the germs of this vegetable organism are derived from the air.

When examined with a good sixth or eighth inch objective the green growth is seen to consist of approximately spherical bodies of very simple structure. They consist of a cell-well, enclosing a green fluid, in which are a few patches of minute reddish granules. In general appearance they resemble *protococcus*, but are much smaller, and belong to that somewhat indeterminate group of bodies which are classed together as *crococcus*. My own observations in this respect are confirmed by those of several biological friends. A small quantity of the growth formed in sodium phosphate, when transferred to a clear solution of magnesium sulphate, multiplies and flourishes just as vigorously as in the original liquid, and *vice versâ*.

Both solutions no doubt contained small quantities of ammonia, and the sodium phosphate contained some sulphate. The amount of phosphoric acid in the magnesium sulphate solution was, however, not sufficient to give a reaction with ammonium molybdate. The magnesium sulphate is, however, prepared from dolomite, which almost invariably contains small quantities of phosphoric acid, hence it is probable that we have here further proof that the formation of these green vegetable growths constitutes a most delicate test for phosphoric acid.

A vote of thanks was accorded to Mr. Bothamley.

The PRESIDENT, in putting it, said he gathered from the concluding paragraphs of the paper that Mr. Bothamley was going on with the subject, and if so he would no doubt tell them in due time what would happen if they put phosphoric acid or a phosphate of potassium, etc., into the solutions in which he had not yet observed any growth.

Mr. PRESTON said he should like to know whether Mr. Bothamley had had under consideration Fehling's solution, which was so very difficult to keep. Very often, when it would act while freshly made, after being kept a little time it would become of little or no value. Perhaps the cause of that might be traced to the presence of these

vegetable organisms. He had found when in preparing that solution great care is taken to scald out the vessels, and to use other necessary precautions, the solution kept almost an indefinite period.

Mr. Parker asked if it were not possible that the growth of fungi might be due to the absorption of ammoniacal salts from the air, such being frequently present in the atmosphere of a pharmacy or laboratory.

Mr. Greenish said the Conference was indebted to Mr. Bothamley for bringing this subject forward; the changes which took place in pharmaceutical preparations had not received as much attention as they deserved. It was found, for instance in vin. ipecac., that a change was constantly going on in the bottle, and if they examined it by the microscope, they found fermentation active, cells being distinctly visible. Again, if they took orange-flower water they found a yellow deposit, and on examining it under the microscope it would be found full of bacterian life. It was also of great importance to pharmacists that these fungoid growths which appeared in solutions, even made according to the Pharmacopœia, should be studied; but it was found by many dispensing chemists very desirable and almost necessary to keep solutions of a great many salts, and he found that in nearly every one of them there would be more or less of fungoid growth, which caused great annoyance. It was not confined to any one solution, but he scarcely knew of one in which it did not appear. He had himself cultivated a fungus grown in a solution of arsenic, a very interesting fungus; and he had cultivated another in a solution of strychnine, which was also very interesting. But it was well known to fungologists that the particular fungus could not be determined from the vegetative process or the mycelium; it must proceed to fructification. Now the fructification of a fungus in a solution would not take place so long as there was any portion of the material which afforded the fungus nourishment in the solution, and what made this matter of great importance was that if the fungus was allowed to continue to vegetate and increase its mycelium in a solution which might contain a certain amount of strychnia, or anything else, a portion or the entire of the active principle or medicinal property would disappear; therefore, it was highly desirable that this matter should be thoroughly investigated, and he sincerely hoped that Mr. Bothamley would continue these inquiries, and in continuing them that he would not be satisfied in examining merely the mycelium which was found in the solution, but would take out the fungus, place it in distilled water, wash it, remove the nutri-

ment on which it fed, and then endeavour if possible to promote its fructification. That could only take place on the surface if it were a fungus; if it were an alga it would of course take place under the solution. As these things appear in almost every aqueous solution used by dispensing chemists, it was imperative that attention should be paid to them.

Dr. SYMES said he did not think that the presence of fungoid growth was in itself evidence of the presence of phosphoric acid, but he thought Mr. Parker's suggestion of ammonia assisting in its development would hardly hold good, because the flasks were simply plugged with cotton wool, placed side by side with those not plugged, the contraction and expansion of the air going on freely, and he assumed the ammonia would enter the flasks, and if ammonia had anything to do with the development, the growth would be found in them all.

Mr. PARKER remarked that although ammonia might get into vessels which were plugged by cotton wool, the germs would be kept out.

Mr. EKIN said he might mention one instance where neither ammonia nor phosphoric acid had anything to do with a growth of this sort. It occurred in an experiment with one of the azo-colours, in which the principal ingredients were amidoazobenzol and β-naphthol. The precipitated colour became a solid gelatinous mass from fungoid growth in the space of twenty-four hours. It certainly startled him, and he had never been able to get any explanation of it.

Mr. GREENISH said Mr. Bothamley spoke of the germs being in the atmosphere, and of the fungi appearing in some solutions and not in others. Now the fungi were different in the solutions of arsenic and in the solutions of strychnia. Fungi would grow where there was a nidus suitable for them, one in one material and a different one in another.

The Conference then adjourned for luncheon.

The next paper read was on—

THE SOLUBILITY OF MORPHIA SALTS.

BY D. B. DOTT, F.R.S.E.

Early last year I read a short paper on the solubility of some of the salts of morphia, a report of which was printed in the *Pharmaceutical Journal* of January 29, 1881. Since that time two

communications on the above subject have appeared in the same Journal, both originally proceeding from the other side of the Atlantic. The first is a paper * by Professor Frederick Power, on "The Solubility of Sulphate of Morphine," and the second is by Mr. J. U. Lloyd on the "Solubility of the Officinal Morphia Salts in Water and Alcohol." † Neither of these experimenters has thought fit to take any notice of my paper, nor would I of theirs, if they merely confirmed or superseded mine. As, however, I consider both of them to be very much open to criticism, I should like to take this opportunity of pointing out what I believe to be their errors.

No exception can be taken to the method employed by Professor Power in determining the solubility of the sulphate, although it is not a process applicable to all salts. It consists simply in estimating the sulphuric acid as sulphate of barium and from that calculating the corresponding amount of sulphate of morphia. Professor Power also determined the solubility by evaporating to dryness a weighed portion of the saturated solution. The ratio given by the two methods, which ought to have yielded identical results, presents a difference of about 2·5 per cent.—a somewhat serious discrepancy. The former method is the one relied on, and Dr. Power concludes that "1 part of sulphate of morphia requires in round numbers 24 parts of water at 15° C. (59° F.) for solution." This result, however, is arrived at by dividing the *weight of the solution* by the weight of the salt dissolved therein. Now, it is manifest that in order to ascertain the amount of water holding a salt in solution, we must deduct the weight of the salt from the weight of the solution. The solubility is then obtained by dividing the weight of the solvent by the weight of the salt. Thus treated, Professor Power's numbers give for the solubility of morphia sulphate in water at 15° C., 1 in 22·99 by the precipitation method, and 1 in 20·44 by the evaporation method. The Professor speaks of "disregarding the slight increase of volume produced by solution;" yet I cannot see what increase of volume has to do with the matter.

Turning to Mr. Lloyd's paper, I find that his method of determining the solubility of salts in the cold is by evaporating a weighed portion of the saturated solution, which is the plan I have always adopted. Mr. Lloyd allows the solution to evaporate spontaneously, weighing the residue with its water of crystallization.

* *Pharm. Journ.*, [3], 798.

† *Ibid.*, 1036.

This, of course, is of no consequence if care be taken that the crystals have not effloresced. Referring to the residue remaining from an alcoholic solution, Mr. Lloyd remarks: "The alcohol may abstract more or less water of crystallization, and fail to take its place in like amount, if at all, thus leading us into a slight error." I am not aware of a single instance of alcohol combining with an alkaloidal salt, and all the well-known morphia salts separate from 85 per cent. alcohol with the same proportion of water of crystallization as when crystallized from water. I regard Mr. Lloyd's system of boiling a known weight of water in a retort and gradually introducing the salt through the tubulure as an elaborately erroneous method of ascertaining the solubility of the salt in the boiling menstruum. For ordinary determinations the flask containing the boiling solution may be tilted so as to pour some of the liquid into a capsule, which is immediately covered, and weighed when cool; while for more accurate estimations a small vessel fitted with a cover may be let down into the boiling solution. The solubilities given for the hydrochloride and sulphate are evidently nearly correct, but that of the acetate is certainly wrong. I am quite aware that there is some difficulty in ascertaining exactly the solubility of the acetate. This arises from the readiness with which that salt loses its acid, and also from the fact that a proportion of the free morphia is dissolved when the basic salt is brought in contact with water. Mr. Lloyd's ratio of 1 part acetate to 11·7 parts water is far wide of the mark, as the true solubility is not far removed from 1 in 2, which are the numbers given in my paper formerly referred to. When a saturated solution of morphia acetate is boiled, decomposition takes place and a certain amount of morphia is deposited. No doubt if a sufficient quantity of acetic acid be then added a clear solution is obtained, but it would hardly be safe to take the result of such an experiment as indicating the true solubility of acetate of morphia in boiling water; yet this is Mr. Lloyd's process. All the morphia salts, so far as I am aware, are less soluble in alcohol than in water, but the statement that "acetate of morphine is not so soluble in alcohol as the alkaloid morphine" is quite erroneous, the converse being correct.

I intended to have ready for this Conference a carefully compiled table of the solubility of morphia salts, but various circumstances have conspired to prevent me, especially the warm weather, as I wished to make all the determinations at 60° F. I trust, however, that what I have written will help to clear the ground for future work. Meanwhile the table which I formerly gave, and which is

printed in the *Year-Book of Pharmacy* for 1881, will be found "sufficiently correct for practical purposes."

The PRESIDENT, in proposing a vote of thanks to Mr. Dott, regretted that he was not present, and also Professor Power. Considering the difficulty of getting at the solubility of any salt or substance in fluids, and indeed the general indefiniteness and haziness of the matter altogether, he was not sure but that Professor Power was right in disregarding the slight increase of volume which was produced when a salt was added to water; at all events, in the cases mentioned. At the same time investigators were not quite so accurate as they might be in describing what they meant by solubility. It was common to see the solubility of a given salt stated to be 1 in 10, but we did not know whether that was 1 part by weight in 10 volumes, or that 1 part had been put into 10 parts of the fluid, or whether 10 parts by weight of the fluid contained 1 part of the solid.

Mr. PARKER said he had been looking forward with considerable pleasure to this paper, and was very disappointed at Mr. Dott's absence. The subject of solubility was somewhat unsatisfactory; he would suggest that there should be standard conditions for the taking of solubilities, recognised through all countries. It was a disputed point as to its variability, but as far as his own work went he was satisfied that solubility might vary very much with the conditions under which it was observed. The solubility of a body of definite chemical constitution which was not altered in composition by the action of heat might be very well taken by the method of evaporation, but there were many bodies, volatile at a moderate dry heat, which could not be taken in that way; the solubility of the substance which he had the honour of bringing before the Conference on the previous day illustrated this fact. The chief point he had noticed was that when the substance was added to the cold menstruum, and the "point of saturation" observed, the result differed from that obtained by making a stronger solution with the aid of heat, and noting the "point of crystallization." In the case of terpin hydrate the solubility in cold alcohol was 1 in 13, whereas, taken in the hot way, it would be 1 in 11, so that either statement would be altogether useless unless the conditions under which the solubility was observed were mentioned. It would be very valuable to have throughout the whole range of chemical solubilities one standard by which they should be taken. Of course there would be some cases in which it

might be taken more satisfactorily by another method, but these should be mentioned as exceptions to the general rule. The point of cold saturation appeared of most value to the pharmacist.

Mr. WILLIAMS thought this question of solubility had really a wider bearing than had perhaps been indicated either by the author of the paper or by the last speaker. The solubility of bodies seemed to be very intimately connected with their power of crystallization, and with that which arrested crystallization. He might remind the Conference of a paper which appeared in the *Pharmaceutical Journal* a few weeks before, by M. Tanret, in which he proved that caffein, which was extremely insoluble, was rendered soluble by salicylate, benzoate, or cinnamate of sodium. He had made some of the salicylic and some of the benzoic compounds, and they certainly were not chemical compounds, for chloroform dissolved the caffein from them; therefore, the caffein was merely held in them in a chemical form, or in a solution, but they could be converted into dry substances. These bodies, however, caused caffein to be perfectly soluble. This would upset, therefore, any attempted standard of solubility in a most important manner, and he believed caffein was not the only substance in which the same thing was illustrated. He would refer to salicylic acid and many of the alkaloids, which were really uncrystallizable until they got rid of the impurity, often in a very minute quantity, which entirely prevented their crystallization. That was very often represented by what was called solubility. He was very much of opinion that solubility should be taken rather as the measure of the want of power of crystallization than as simply the power of solution. Sulphate of lead, for instance, was a very insoluble body, absolutely insoluble probably in pure water, but it was known how terribly soluble it was in some solutions, such as sugar, acetate of sodium and some other bodies. For these reasons it seemed almost impossible to make a standard.

Mr. SHENSTONE said that already there was one practice which predominated in the statement of solubilities. He had lately been engaged a great deal on this question, and in looking through other people's work he found a large number of the old investigators gave their solubilities as the amount of salt dissolved by 100 parts of water, and those who made experiments of this kind would save a great deal of trouble by adopting that as their standard. If it became the practice of everybody working in this line to adopt that method it would simplify matters for the future, for if all adopted different standards it was very inconvenient. With regard to Mr.

Williams's remarks, he did not think the case he alluded to, *i.e.* the solubility of caffein in salicylate of sodium, was necessarily not a case of chemical action, because of the possibility of extracting the caffein from that solution by chloroform. It was possible that when caffein came into the presence of the sodium salicylate, chemical action took place, a certain amount of salicylate of caffein being formed, and a certain amount of sodium hydrate set free in the solution. If the solution were now treated with chloroform, the result would be that the free caffein which remained there would be removed, and then the equilibrium being upset a reverse action would take place, some of the caffein being set free, which the chloroform would then remove, and this would be repeated, so that practically it might all be got out again.

Mr. P. W. SQUIRE said the value of solubilities depended very much on the object in view. For example, if a person wanted to dissolve a salt in water, and had no notion about how much it would dissolve, the information he required was how much salt would dissolve in a given quantity of water. If, on the other hand, a manufacturer had a liquor which he wished to crystallize out, he viewed it from the point of how low it ought to go before the substance ought to crystallize out, and therefore he looked at the question from a totally different point of view from the other man. The salt would not crystallize out until it was supersaturated. It occurred to him, therefore, it was something like the case of 32° F. being looked upon as either the freezing point of water or the melting point of ice. It was rather the melting point of ice. He should call solubility the amount which would be dissolved in water, and the other point when it would crystallize after evaporation the point of crystallization rather than solubility.

A paper was then read entitled—

NOTES ON THE PHARMACY OF CINCHONA.

BY R. W. GILES.

It may be taken for granted that the members of the Pharmaceutical Conference are perfectly well aware of the contradictory and unsatisfactory state of the pharmacy of cinchona, for there has scarcely been a meeting at which it has not been pressed upon their notice, so that they may possibly ask "What is the use of this wearisome iteration?" The answer is that the grievance remains,

and custom and prejudice are so inveterate that it is necessary to attack it again and again, even with the same weapons, before amendment can be hoped for. In this way alone pharmacists are able to exercise some influence upon their own Pharmacopœia.

All practical pharmacists must be aware that it is next to impossible to obtain officially recognised cinchona bark of the official alkaloidal standard; while there is no lack of barks of superior alkaloidal value and equally well adapted to pharmaceutical purposes which are not officially recognised. These evident truths have been asserted amongst others by Trousseau et Pidoux (*Traité de Thérapeutique*), Professor Flückiger (*Pharmaceutische Zeitung*), and by Messrs. Umney, Holmes, and Dr. Paul, at meetings of this Conference.

The only dissentient that I know of is Mr. de Neufville, who asserted in a paper read at the last Conference (*Pharm. Journ.*, vol. xii., p. 369), that the *supply of flat* calisaya during the past few years had been abundant, and the *quality of quill* calisaya had been good; but I cannot put that and that together so as to amount to a statement that in his opinion there had been an abundant supply of good calisaya bark; and even then I should be obliged to conclude that the preponderance of evidence was against him.

Thus far the cinchona difficulty appears to be geographical; good barks, far exceeding the modest pharmacopœial standard, being excluded because they do not grow west of Greenwich and do not bear the name of calisaya. These do not appear to be distinctions of sufficient importance to place in opposition to scientific tests. Dr. Paul put the case clearly and conclusively when he said that an alteration was necessary in the range of selection of pharmaceutical barks; that South American barks should not be excluded, but that Indian barks should be admitted. In other words, let alkaloidal standard be the sole test.

In consequence of the "fearful deterioration of calisaya bark," * and the unsatisfactory state of its pharmaceutical preparations, cinchona has fallen more and more into disuse, to the prejudice of pharmacy and of medical practice, its place having been usurped by quinine, contrary to the opinion of the best authorities upon the relative value of the two medicines. It is the province of pharmacists to rectify this miscarriage amongst their wares, and to restore one of the most valuable articles of the materia medica to its proper place and functions. It is not suggested that they should

* See *Pharmaceutical Journal*, vol. ix., p. 213.

substitute even good Indian bark for inferior calisaya, when the latter or its preparations are prescribed, however unadvisedly; but that they should take care to have in stock bark of sufficient alkaloidal value (independent of the B.P. standard, which is too low) and that they should *educate* the medical profession to the use of it.

Although therapeutics are a forbidden subject, it may be permitted to quote the opinions of orthodox authorities upon the therapeutical qualities of cinchona and its alkaloids as an indication of the direction which pharmaceutical research ought to take, the more so as those opinions show that the chemistry of cinchona has hitherto moved in the wrong direction.

It has been well established by the Medical Commission appointed by the Government of India to investigate the febrifuge properties of the cinchona alkaloids,* and their conclusions are supported by the testimony of English and more especially of continental observers,† that the febrifuge and antiperiodic action of cinchona is common to *all* its alkaloids, and it follows that the exclusive employment of quinine, as it has long prevailed, is a wasteful mistake. But more than this, the best writers upon therapeutics assert that *cinchona* possesses medicinal properties superior to those of any or all of its alkaloids, which Dr. Pereira attributed in part to the astringent properties of the cinchotannic acid, and in part to the aromatic quality of the bark causing the alkaloids to sit more easily upon the stomach.‡ From this it may be inferred that pharmaceutical preparations of cinchona would be free from the objection sometimes charged against the mixed alkaloids employed in India under the name of cinchona febrifuge, that they excite nausea. In Neligan's 'Medicines,' similar opinions are expressed, viz. (p. 737): "Most practitioners are of opinion that none of the alkaloids possess the same medicinal properties as cinchona bark, *more especially in the treatment of intermittent diseases* . . . and . . . I must, however, confess that every day's increased experience induces me to prefer the preparations of bark to those of any of its alkaloids when a *tonic* effect is sought for."

Why then should "*most practitioners*" have so far changed their opinions, or at any rate so altered their practice, as to substitute quinine for cinchona almost universally, and particularly in those periodic diseases for which it is so emphatically asserted that none

* *Pharmaceutical Journal*, vol. ix., pp. 78, *et seq*.
† Pereira, vol. ii., pt. ii., p. 132; Neligan, p. 736.
‡ Pereira, vol. ii., pt. ii., p. 137.

of its alkaloids possess equivalent virtues? Is it not, at least partly, because, in the words of Mr. Umney already quoted, "Calisaya bark has deteriorated to a fearful extent of late," and, as Dr. Paul told the Conference last year, "It now really contains nothing more than a little cinchonine."

It may be very loyal to the Pharmacopœia to continue the unquestioning supply of calisaya bark which was described upon the same occasion as "almost invariably worthless"; but how about the welfare of fever-stricken patients, and the credit of pharmacy? It must not be forgotten that the Pharmacopœia never initiates anything; it is a codex of remedies which have already been approved and which it has become desirable to place under control.

The reputation of cinchona has once before suffered, at a very early period after its introduction into Europe, from a similar deterioration in the importations of South American bark. The early supplies brought over from Peru by the Count and Countess of Chinchon (1640) proved so effectual in the cure of fevers and agues, that more orders were sent out than the Peruvian merchants could execute properly, and they sent back consignments of inferior barks, which proved worthless, and brought the new remedy into temporary disfavour. This deception is as good a reason as any other for the name of Jesuits' bark, which was conferred upon it at about this period.

There was no quinine in those days, or probably the parallel with our present experience would have been complete; but having no substitute, the common sense of the 17th century set an example to the science of the 19th. It discarded the worthless barks, and supplied itself with others of suitable alkaloidal standard assayed by the fever test. In these days of practical science brokers sell, and quinine makers buy, cinchona bark on the basis of its alkaloidal percentage, ascertained by exact analysis. The pharmacist alone buys haphazard the "showy barks," often very poor in alkaloids, and hence known as "druggists' barks," which the quinine makers are only too happy to leave for him, and the dealers only too pleased to get rid of, though for pharmaceutical purposes percentage of alkaloids is more than a relative test of value; it is an absolute test of fitness.

The very reverse ought to prevail; the pharmacist should secure the first choice by being willing to give a better price than the quinine makers, who can only give the alkaloidal value, which is, literally, the intrinsic value of a part of its constituents. Under this system the pharmacist would get much better value for his

money than he does now by buying a "showy bark destitute of alkaloids." I have heard of a time-honoured establishment, which I must not further particularize, buying several serons of calisaya bark at 3*s*. 6*d*. per lb. which proved to contain not a particle of quinine, and only a very small amount of cinchonine. Its assay value certainly would not have exceeded 6*d*. This is a sort of bark which should be left for the stores, whom it would exactly suit, and where no questions are asked.

The question then is, "What standard should be adopted for the cinchona of pharmacy?"

First, it should be an alkaloidal standard, not a quinine standard.

Secondly, it should be a mean and not an extreme standard.

And, thirdly, it should be catholic, admitting barks from all sources, without arbitrary geographical distinctions, which, originally intended as definitions, have now become irrational limitations.

At the Conference of 1878, Mr. Umney spoke of East India bark, containing 5 or 6 per cent. of quinia, as the future source of fine fluid extract, and, if of fluid extract, of other pharmaceutical preparations. Assuming him to have meant 5 or 6 per cent. of mixed alkaloids, that would be a reasonable standard to insist upon; say a minimum of 5 per cent., which holds a mean place between the extremes. I have computed the actual average of ninety-three lots offered on sale by the Dutch Government last year, and find that it is exactly 4·7 per cent. The highest quality reached 9·8 per cent., the lowest touched 1·2 per cent., giving a mean of 5·5 per cent. The mean of the two results is therefore 5·1 per cent.

It remains to be considered how this standard should be secured, for it is to be feared that pharmacists generally do not submit their purchases of cinchona to the pharmacopœial test, and it is well to acknowledge that refined tests are not practicable in the pressure of daily business. Mr. Holmes, probably having this difficulty in view, suggested that the wholesale druggists should be required to state the percentage of alkaloids in the samples they offer, but this is scarcely sufficient for the protection, or for the credit of the pharmacist.

The same difficulty seems to have presented itself to Messrs. Squibb, of New York, who have endeavoured to meet it by publishing what they consider a simple easy process of assay, suited to the wants and the skill of well-trained pharmacists, who are not expert quinologists. Whether the process possesses the desired qualities of simplicity and facility may be judged by perusal of the

description at p. 77 of the third number of Messrs. Squibbs' *Ephemeris.*

In pursuit of a similar object I have been led to prefer the more simple hydrochloric acid process, which I tried on the recommendation of Dr. de Vrij, in his laboratory at the Hague, and with the advantage of his assistance. The *modus operandi* finally adopted is as follows:—

Take 25 grams finely powdered cinchona bark, mix with 2·5 c.c. strong hydrochloric acid (= 2·6 c.c. B.P. strength) in 30 c.c. distilled water, or just so much as suffices to moisten the bark; set by for two hours, add 100 c.c. distilled water, and let stand for twelve hours or more, stirring occasionally until all foam disappears from the surface. Pour into cylindrical glass percolator, the mouth of which has been stopped by a pinch of charpi loosely dropped into it and moistened with a little water, and recover the clear percolate. Pour on more water until the percolate ceases to be precipitated by caustic soda. In this way about 300 c.c. are recovered. Precipitate with caustic soda in considerable excess. Set the mixture by for twelve hours, when it will be found that the alkaloids have settled in a compact coherent stratum from which nearly the whole of the supernatant may be decanted. The decantate must be reserved. The precipitate is then poured upon a filter, and washed with a little weak solution of soda to remove traces of cinchona red; finally it is washed with a little distilled water, the whole of the washings being added to the decantate, and the measure noted. When the precipitate has drained, it is to be carefully transferred to a tared porcelain dish, dried over a water-bath and weighed. The weight should not be less than 1·25 grams, corresponding to 5 per cent. mixed alkaloids. But this will not be an exact indication of the alkaloids contained in the bark, as an appreciable quantity remains dissolved in the mother-liquor. Practically this may be estimated as 0·05 grams in 100 c.c., which should be added to the ascertained weight of the precipitate, and the sum multiplied by 4 gives a very close approximation to the true percentage, quite near enough for pharmaceutical purposes. When greater accuracy is desired the mother-liquor is treated with benzol, and the alkaloids are recovered by operations which it is not necessary to describe, as they need not be employed in pharmaceutical assays.

The merit of the above process is its simplicity and facility of manipulation; the several stages may be set going as opportunity offers, and they proceed automatically without withdrawing the operator from other duties. Secondly, the results correspond with

the amount of alkaloids which can be extracted in practical operations.

If it were not for the title of this paper there would be no reason for saying anything about the pharmaceutical preparations of cinchona. As it is, a very few words will suffice. It is notorious that they do not meet the demands of modern medical practice. Cinchona won its reputation by administration in the form of powder, it has lost it by the substitution of inferior preparations of inferior bark. The tincture, decoction, and infusion of former generations have had their day, and are becoming obsolete; never again to find favour with prescribers, pharmacists, or patients. They are all too feeble in alkaloids for administration, when the specific effects of cinchona are in question. Their qualities and their condemnation will be found in a paper by Mr. Ekin, in *Pharm. Journ.*, vol. ix., p. 213. Nor can it be necessary to pour more obloquy upon the much abused fluid extract, which has never yet found a single defender. Its poverty and its wastefulness have been often told. The best that can be said for it is that when carefully prepared from barks of suitable quality (which does not mean barks rich in alkaloids) it possesses agreeable astringent properties, associated with an unimportant amount of alkaloids which render it acceptable as a vegetable tonic, but it leaves the major part of the valuable and characteristic cinchona principles in the imperfectly exhausted bark.

Fluid extracts are the pharmaceutical preparations of the day. Their convenience commends them equally to the medical practitioner, to his patient, and to the dispenser, and the demand for them is not likely to be diverted; but a fluid extract of cinchona, worthy of its name, is still a desideratum in pharmacy.

The PRESIDENT proposed a vote of thanks to Mr. Giles. He feared the present was not the proper occasion for going into any question as to what principles the cinchona bark owed its therapeutical properties to; their time would not suffice to consider that, even if they had sufficient medical knowledge to do so; but several important pharmaceutical questions had been brought forward in the course of the paper, and those might very profitably be discussed.

Mr. WELLCOME said the subject of supplying chemists with bark of definite alkaloidal strength for dispensing and manufacturing purposes had been much discussed before, and he believed that some houses did offer to chemists with their bark an assay giving

the definite alkaloidal strength. That was the custom of some houses in regard to opium, and he believed Dr. Squibb and others supplied the trade in America with barks, with which he furnished assays. It appeared to him that that was one of the most important safeguards, and, while he thought it desirable that every chemist should be able to assay for himself the alkaloidal strength, and to determine the amount of the respective alkaloids, it was hardly practicable that he should depend entirely on his own assays, and after all the guarantee of a respectable house would be the best general safeguard. As to the question of the strength that should be accepted as a standard for pharmaceutical preparations, some members of the Conference might remember that he strongly urged last year that the quinine strength should not alone be accepted, but that a definite alkaloidal strength of the various alkaloids should be the only standard. A bark which yielded two per cent. of quinine ought to be satisfactory for manufacturing pharmaceutical preparations, providing it contained a proper amount of cinchonidine, quinidine, and cinchonine, say to make 5 per cent. total alkaloidal strength. Quinoidine was also very active, and some of the preparations most sold in the tropics for checking fever and ague consisted almost entirely of that resin, which was by many considered a modified or uncrystallizable quinine.

Mr. Southall said he could quite confirm the difficulty which had been mentioned in regard to getting a reliable calisaya bark for pharmaceutical purposes. There was still a good run on the preparations of bark other than the extract and tincture. The decoction was very much ordered by medical men in his part of the country, and was more relied upon than either the fluid extract or tincture.

Mr. Hampson thought they would be more likely to reach the point the author aimed at, of having an accepted standard quality of bark, or bark yielding a certain proportion of alkaloids, if there were a standing committee of pharmacists, and not a pharmaceutical committee formed by the Medical Council entirely. The Pharmaceutical Society ought to be legally recognised in all these matters, and if practical pharmacists held their proper position with respect to the National Pharmacopœia, these important changes or improvements would be sooner brought about. As it was, these changes came about in an indirect and slow manner, and improvements did not take place as fast as they should.

Mr. Ekin said he feared the medical men in Birmingham had made rather an unhappy selection, according to Mr. Southall's

statement, for in the experiments he had made, which were referred to by Mr. Giles, he found the decoction was by far the weakest in alkaloidal value of all the officinal preparations.

Dr. SYMES confirmed Mr. Southall's statement, that the decoction was very largely used, and very much relied upon, by medical men; it was not peculiar to Birmingham.

The PRESIDENT said it would be seen from the remarks which had been made that they greatly needed increased activity in the promotion of therapeutical research, and it would be well if there were a society for this purpose formed by medical men having competent chemical and physical knowledge.

Mr. GILES, in reply, said he could not claim that what he had brought forward was new, but still it sometimes did good to repeat what was already known. With regard to the alkaloidal standard, Dr. Pereira pointed out that cinchona made its reputation as a febrifuge by the use of a species of cinchona which was not rich in quinine, but in which cinchonine largely prevailed, and this seemed to show that they had made a mistake in pinning their faith so much to the alkaloid which happened to be first discovered. Although recent investigations appeared to show that it was necessary to give cinchonine or quinidine or cinchonidine in larger doses than quinine to produce the same effect, there appeared to be no difference in the effects produced, and, therefore, it seemed to be a great waste to throw away that which might be recovered simultaneously with the quinine. At all events, it seemed to him that it was rather their business to support the pharmaceutical manipulation of things than the chemical. He had often been disposed to think that chemistry had been ridden a little to death, and that isolation of active principles had been carried too far.

The following three papers were read successively before a discussion was taken upon them:—

NOTE UPON THE ACTION OF GLYCERINE ON SOME SALTS OF IRON.

BY G. F. SCHACHT.

About two months ago our friend and fellow member, Mr. Shenstone, brought me the remains of a mixture that had been dispensed for him, and which appeared to have undergone during the interval

a somewhat interesting change. The prescription runs as follows:—

℞	Tr. Ferri Perchlor.	ʒiss.
	Glycerini	ʒvj.
	Aquæ	ad ℥vj.
M.		

The mixture when first prepared was of a pale sherry colour, and possessed an astringent metallic taste. When brought to me, however, by Mr. Shenstone, the colour had almost disappeared, and the taste was sweet and metallic, but not astringent. It appeared, in fact, as though the iron had become reduced from the ferric to the ferrous condition.

The application of ferricyanide of potassium and of sulphocyanide of potassium showed us that this change had really taken place to a very considerable extent, but not quite to the complete reduction of the perchloride.

Mr. Shenstone kindly left the matter in my hands, and I deem it of sufficient interest to bring before the Conference.

My first experiment naturally started with a repetition of the original prescription and an examination of the results at the moment of mixture; and though somewhat prepared for the fact by previous observation, I found it necessary to record as the first memorandum that the *tincture* of perchloride of iron taken from the ordinary dispensing bottle was no longer what it was when originally mixed, for it gave an emphatic bright green colour with ferricyanide of potassium.

It was clear, therefore, a change in the condition of the iron in the *tincture made with ordinary alcohol* had commenced to take place similar to that suspected to have been developed under the influence of glycerine.

The mixture, however, still exhibited the usual deep red reaction with sulphocyanide of potassium, indicative of a plenteous proportion of unreduced ferric chloride. It was loosely corked and placed in a fairly light position in the laboratory, but not in direct sunshine.

After a fortnight's interval it was examined. It still in part retained its pale sherry colour; it produced a deep blue with ferricyanide, and a much less deep red with the sulphocyanide, of potassium.

It has been kept since that time (about three weeks) under similar conditions, and I do not observe much further change.

A similar mixture was prepared and placed where it could *receive the direct rays of the sun.* After two days it was found to be colourless, to show abundant evidence of ferrous iron, but not to have entirely lost its property of reddening with sulphocyanide, nor has further exposure to the sun and the addition of more glycerine to the mixture entirely deprived it of this property.

Sunlight was also found to produce a similarly accelerating effect when the ferric chloride was subjected to the reducing action of ordinary alcohol.

It being clear, then, that glycerine possessed in a marked degree the power of reducing iron from the ferric to the ferrous condition, it was thought probable that it might be employed to prevent the converse change of ferrous into ferric salts, which is sometimes so inconvenient.

A mixture was therefore prepared consisting of—

Ferrous Sulphate	gr. x.
Dilute sulphuric acid	♏ xv.
Glycerine	ʒvj.
Water	to ℥vj.

and was kept in the diffused light of the laboratory. When first mixed it resisted all the fascinations of the sulphocyanide, and bestowed upon it not the slightest blush; but after a few days the usual demoralization had commenced, and the salt showed distinct signs of peroxidation. The amount of this action, however, appeared to have a limit, the proportion of ferric salt produced being very similar to that left unreduced in the former experiment.

Exposure to sunlight did not appear to influence this mixture in any special manner.

In connection with the probable further chemical changes that accompany these phenomena, I may mention the results of two further sets of experiments that were made, though I need not recite their details. They showed that both glycerine and ordinary alcohol reduce permanganate of potash rapidly.

I find that the behaviour of glycerine under treatment with permanganate has been already studied, and that according to Kasmann (*Bull. Soc. Chim.* [2], xxvii. 246) the change consists in the conversion of 2 molecules of glycerine *plus* 1 molecule of oxygen derived from the permanganate into 1 molecule of glucose and 2 molecules of water, thus:—

$$2\,(C_3H_8O_3) + O_2 = C_6H_{12}O_6 + 2\,(H_2O).$$

Whether the changes brought about by the persalts of iron are

similar to the above throughout, I am not at present prepared to assert, but that such should be the case appears to me very probable. The question is very interesting, and will, I hope, one day be answered.

In the meantime, pharmacists and medical men may with advantage remember that ethyl alcohol and glycerine (and probably other alcohols) reduce persalts of iron, and tend to prevent the oxidation of protosalts, and that this influence appears to be stronger when the mixture is exposed to sunlight than when it is left in the shade.

NOTE ON A REACTION OF GLYCERIN AND OTHER POLYHYDRIC ALCOHOLS.

By Wyndham R. Dunstan, F.C.S.,

Demonstrator of Chemistry in the Laboratories of the Pharmaceutical Society.

The reaction which forms the subject of this note is one which has been observed during the course of an investigation upon the action of some polyhydric alcohols upon sodium biborate. The fact that when certain of these alcohols are added to a solution of borax an acid reaction results, was first noticed by Klein (*Compt. Rend.* lxxxvi. 826). In the case of glycerin, this reaction has been further studied by Senier and Lowe (*Pharm. Journ.* [3], viii. 819), who have also proposed a test for glycerin based upon it (*Journ. Chem. Soc.*, xxxiii., 438). In this reaction glycerin appears to resemble an acid in its action. If, however, the acid solution obtained by the addition of glycerin to an aqueous solution of sodium biborate be heated, the liquid becomes alkaline. The first published observation of this fact was made by Donath and Mayrhofer (*Zeits. f. anal. Chem.*, xx., 379), who considered this reaction characteristic of glycerin, and propose to employ it as a test for this substance, using litmus as an indicator of the reaction. No test experiments, however, are detailed by these observers. In the present note the results of some experiments are given which, although not originally instituted for this purpose, indicate the delicacy of the reaction and also its invalidity when considered as specially characteristic of glycerin.

A number of experiments were first made to determine the delicacy of the reaction. The results led to the employment of a dilute solution of sodium biborate and to the abandonment of litmus as an

indicator of the reaction. Even when a dilute solution of borax was employed the colour-changes of the litmus were ill-defined. Other indicators were then experimented with, and, finally, satisfactory results were obtained by the use of phenol phthalein. When an alcoholic solution of this substance, which is faintly yellow, is added to a solution of borax, a rose-red colour is produced owing to the alkalinity of this salt. Upon the addition of glycerin to this solution the red colour at once disappears, the solution being acid and colourless. Upon heating the liquid the rose-red colour is again developed, reaching the maximum tint near the boiling point of the solution. As the liquid cools, the colour gradually fades away, until finally the solution is again colourless. The colour-changes are sharp and well defined. Experiments have been made with solutions of borax of various strengths. The best results were obtained with a half per cent. solution. A convenient method of applying the test is to take two cubic centimetres of a half per cent. solution of borax, and add sufficient of an alcoholic solution of phenol phthalein to impart a decided rose-red colour. To this liquid gradually add the solution of glycerin made neutral or faintly alkaline, until the colour is discharged. Heat the solution to the boiling point, the red colour is restored, and after cooling the liquid is again colourless. Excess of glycerin is to be avoided, otherwise the alkalinity of the solution is only partially restored by boiling. The delicacy of the reaction is dependent not only upon the excess of sodium biborate which might be present, but also upon the amount of water. If the colourless solution obtained in the above manner be largely diluted with water the red colour is partially restored. After a great many experiments it was found that using a half per cent. solution of borax, the limit of the test is practically reached at a two per cent. solution of glycerin. Using two cubic centimetres of borax solution, about five cubic centimetres of a two per cent. solution of glycerin were necessary to discharge the colour. When a stronger solution of glycerin is used, the amount required will of course be less than that of a two per cent. solution, but not proportionately less, for the more dilute the solution of glycerin the greater is the action of the water, which tends to reproduce the alkalinity of the solution. Hence the quantity of a stronger solution of glycerin required will be less than the proportional amount calculated from a more dilute solution. The test is not satisfactory with solutions of glycerin of greater dilution than two per cent., as the changes of colour become indefinite, owing to the action of the water. Neither can a more dilute solution of borax than a half per

cent. solution be used for the same reason. I have made a series of experiments upon the utilization of this reaction as a basis for the quantitative estimation of glycerin, but so far the results have not been altogether satisfactory. The reaction is far from characteristic of glycerin, but is more so of the polyhydric alcohols in general. I find that it is also given by mannite, erythrite, dextrose levulose, lactose and mycose. Sucrose (cane sugar) does not behave in the same way, In the case of mannite the reaction is extremely delicate, more so than with glycerin, and the solution is not so amenable to the influence of water as is the solution of the latter substance. Guaiacol, pyrogallol, and saligenin also give the reaction. Orcin and resorcin, when added in large quantity, partially destroy the red colour, but it is not restored by boiling.

Ammonium salts, which are known to liberate boracic acid from solutions of borax (Woodcock, *Journ. Chem. Soc.*, xxiv., 785), discharge the red colour of the test solution, but it is not restored upon heating. In testing liquids for glycerin by this method ammonium salts should be removed by ebullition with sodium carbonate, and the solution either made nearly neutral or evaporated and extracted with a mixture of ether and alcohol before applying the test.

It appears from the above experiments that this reaction is not only given by glycerin, but also by many other polyhydric alcohols, both of the paraffin and benzene series, and by certain sugars. Therefore in testing for glycerin by this method the absence of these substances must be ensured. I hope in a future paper to show precisely the nature of the reaction which occurs between certain of these polyhydric alcohols and sodium biborate.

THE SOLUBILITY OF BORIC ACID IN GLYCERINE.

By David Hooper,

Pharmaceutical Chemist.

The extended application that has recently been made of boric acid combined with glycerine has created a demand for these two antiseptics in many forms. The most prominent among them is a preparation introduced by Professor F. Barff, M.A., and named by him "Boroglyceride" (*Journal of the Society of Arts*, xxx., 516), and still later the glycerborate of calcium and the glycerborate of sodium fully described by M. Le Bon (*Comptes Rendus*, xcv., 145).

But it appears, on reference, that a more simple preparation, the mere solution of the one substance in the other has been little investigated, or at any rate determined, and therefore some experiments were instituted to elucidate this point, and after determining the strength of a saturated solution at the mean temperature of our latitude, observations were continued in order to discover the relationship this result bore to its solubility at other temperatures.

As only two chemical bodies were to be employed in the following determinations, special attention was directed to their purity. The boric acid (B_2O_3, $3 H_2O$) was free from compounds of ammonium and magnesium, and from other salts and acids likely to be met with in its natural state, or in its preparation from borax. Its specific gravity was taken and found to be 1·485. It was used in fine powder and kept under a bell jar over sulphuric acid to prevent absorption of moisture or gases. The glycerine was a very pure sample, it had a gravity of 1·260 at 15·5° C., and was always measured as near this temperature as possible.

The viscid nature of the glycerine, its slower dissolving capacity, and the alteration of boric acid when subjected to heat, make it tedious to estimate their solubility by any of the few ready methods employed when water is the solvent. It eventually occurred to the author that in a case like this some physical formula involving a knowledge of density and volume might well be utilized. As a datum, therefore a solution was thus prepared. An excess of boric acid was added to some glycerine half filling a pint bottle, the mixture was kept with frequent agitation in an apartment where the temperature ranged from 18° C. to over 20° C., after three days the solution was poured off and transferred in another bottle to a cellar, where it was kept for a similar period at 16° C. A slight crystalline deposit had formed in the mixture, due to the reduction of temperature. The specific gravity of the resulting saturated solution was then carefully taken. The weight of a certain volume and the gravities of its constituents being known, the following formula was used to obtain their proportions :—

$$V = V_1 + V_2$$
$$V S = V_1 S_1 + V_2 S_2$$

when V, V_1, V_2 represent the volumes of the mixture, the glycerine and the boric acid respectively, and S, S_1, S_2, their relative gravities.

The working of this formula may be illustrated by calculating from an actual experiment. The weight of a saturated solution

when taken in a 1000 grain bottle was found to be 1290 grains. Substituting this with the other data the formula becomes

$$1000 = V_1 + V_2$$
$$1290 = V_1 . 1{\cdot}260 + V_2 . 1{\cdot}485$$

these two equations worked out simultaneously will give for glycerine, 866·6, and boric acid, 133·3 grain volumes per thousand; the volume of the last-named substance has, however, to be converted into weight. Then by proportion it is shown that 4·37 parts by volume of glycerine dissolve 1 part by weight of boric acid at 16° C.

Some experiments were also made by mixing different quantities of glycerine with the same amount of boric acid and agitating them occasionally for several days, when it was again determined that 4·4 c.c. or practically $4\frac{1}{2}$ c.c. of glycerine were sufficient to dissolve 1 gram of boric acid.

The methods used for determining the saturation point at higher temperatures were according to the following description:—The apparatus employed was, a long test tube furnished with a rubber stopper and graduated from the bottom in cubic centimetres accurately corresponding with those marked on a burette containing the glycerine, and a water-bath consisting of two beakers containing water, the one immersed in the other of larger size, and placed at such a distance over the source of heat so that the temperature might be regulated to any desired degree. A weighed quantity of boric acid and a measured quantity of glycerine were run into the tube, the acid being in excess, glycerine was cautiously dropped in until after remaining in the water-bath for about half an hour, perfect solution was obtained. The temperature was then lowered and the degree at which the mixture began to be turbid was noted, and this was used as a check on the particular determination. After numerous experiments in this manner a line of solubility was formed extending to the boiling point of water. Some of these higher saturation points were tested by keeping the mixtures in stoppered bottles in an air oven with regulated temperature, but I consider the determinations as detailed in the above description would be performed with more expedition if not with more accuracy. It now remained to take the solubility at zero, this was found by diluting a saturated solution with glycerine until the acid ceased to crystallize out when immersed for half an hour in a tube in melting ice.

In the following table the results are exhibited as parts by weight dissolved in 100 parts by volume of the solvent; such a representa-

tion is found in the lines of solubility shown in Fownes's "Inorganic Chemistry" (p. 144) :—

Solubility of Boric Acid in 100 parts of Glycerine from 0° to 100° on the Centigrade Scale.

20 parts at	0°
24 ,,	10°
28 ,,	20°
33 ,,	30°
38 ,,	40°
44 ,,	50°
50 ,,	60°
56 ,,	70°
61 ,,	80°
67 ,,	90°
72 ,,	100°

The solubility of boric acid in water has been determined by Brandes and Firnhaber (Watt's "Dictionary of Chemistry," vol., i. p. 639), the results were calculated so as to make a line comparable with the table just represented. The line formed is not absolutely straight, and although it occurs much lower down on the scale, it is not parallel; a slender convergence takes place in the direction of zero. I propose, if opportunity is afforded, to make fuller comparisons of these two lines and find what relation exists between them when lines of solubility are formed by dissolving the boric acid in glycerine diluted to various strengths with water.

Votes of thanks having been passed to the authors of the above papers,

The PRESIDENT said Mr. Schacht's note was very acceptable, and was a model in many respects. It belonged to a class which was always welcome, being the result of observations in the course of dispensing. With regard to the reaction itself, it had long been known that perchloride of iron was reduced to a ferrous condition by alcohol, and indeed there was in a former North German Pharmacopœia a preparation called ethereal spirit of chloride of iron, made by dissolving the perchloride of iron in alcohol and exposing it to light until the green colour was produced, and a tincture of a very pleasant flavour was obtained. Apparently the reaction was more rapid with glycerine. There might be a reaction such as Mr. Schacht had described, and probably there was a reaction with the glycerine, that substance being, indeed, an alcohol, a polyhydric alcohol as Mr. Dunstan had remarked. Mr. Dunstan's

paper had considerable interest, inasmuch as it would throw light on the constitution, not only of glycerine, but of boric acid, and borax; all which substances being used in pharmacy, any further knowledge respecting their constitution would be interesting to pharmacists. Mr. Hooper's paper seemed rather to bear on the action of antiseptics. Not only were chemists and druggists interested in the preparation and sale of antiseptics, but advice respecting their employment might be very properly given by pharmacists. It was very gratifying to see that Mr. Hooper had produced a paper of this kind, involving a large amount of skill and knowledge, just the paper that should be produced by a chemist who was also a druggist.

Mr. KINGZETT said there was no reason to suppose that the antiseptic property of boroglyceride was any greater or more definite than that of boracic acid on the one hand, or glycerine on the other or a mixture of the two substances into which the compound is resolved again by the agency of water, or even of the tissues in which water is always present. He therefore failed to see on what grounds this substance was put forward as a new or improved antiseptic. Boroglyceride might be regarded for all practical purposes as a mixture of glycerine and boracic acid, and there was no evidence on record pointing to the superiority of the compound as an antiseptic.

Mr. GERRARD was very much pleased with Mr. Schacht's communication, because it explained what took place in a perchloride of iron mixture which was very largely used in his hospital. It always contained some glycerine, and he found, after standing a week or so, the last portion was much clearer in colour than when first made, consequently a mixture made with this residual portion differed in colour from that first made, and it was often a question asked of dispensers why the mixture sometimes appeared dark and at others light. The explanation now given seemed very satisfactory.

Mr. SCHACHT, in reply, said he had nothing further to add except this, that he must acknowledge he did not remember, perhaps he never knew of the German preparation that had been referred to, but he was aware that there had been plenty of observations bearing upon this point by other men, and he should not have troubled the Conference with it, but at the time he first made his notes he thought it was just possible that he should be able to add something to what was known of the processes that went on during the change. The difficulties of the case, however, had been a little

too much for him, and he had not been able as yet to determine what exact changes did take place.

The following papers were then read—

NOTE ON METHYL ORANGE AS AN INDICATOR OF FREE ACID.

By B. S. Proctor.

Dr. Lunge, in an article in the *Chemical News*, December 16, 1881, advocates the use of methyl orange (sulpho-benzene-azo-dimethylamine), as an indicator in alkalimetry. I have found it useful also as an indicator of the presence or absence of free acids in salts, which in their normal condition have an acid reaction with litmus.

One grain of the dye in a pound of water makes an orange-yellow test liquor, two or three drops of which added to 1 ounce of water give it a yellow tint, which is changed to pink by a very small trace of free mineral acid.

It is not so sensitive to oxalic acid, still less so to acetic, and not at all affected by carbonic.

Ferrous Sulphate.—The yellow liquor is not coloured pink by a solution of pure ferrous sulphate, though the change is at once effected by a trace of free sulphuric acid in the presence of the sulphate.

With Perchloride of Iron the indications are not so satisfactory; the colour is deepened but the reaction is not clearly marked when neutrality is disturbed by additions of hydrochloric acid or ammonia.

Alum.—Pure or commercial alums do not change the colour of the orange, though they strongly affect litmus; a trace of free sulphuric acid added in the presence of the alum at once changes the orange to pink. Ammonia being added to this pink liquor promptly rendered it yellow and turbid; dilute sulphuric acid being then added drop by drop with an interval, and constant stirring, each drop produced an instantaneous tint of pink, which gradually changed back to yellow, as the acid was neutralized by the alumina in suspension; when the successive additions of acid had dissolved nearly all the alumina, the restoration of the yellow colour became very slow, finally the pink colour appeared permanent before the last traces of the alumina had dissolved.

Sulphate of Zinc.—1 ounce of water, 1 grain of sulphate of zinc, 4 drops of test liquor, remained faint yellow and changed to pink on the addition of $\frac{1}{4}$ of a drop of dilute sulphuric acid. On adding ammonia and acid the reactions were similar to those obtained with alum

Repeating the test with sulphate of zinc to acertain its delicacy, 1 ounce of water with 1 drachm of sulphate of zinc, and four drops of the test liquor, remained faint yellow, but changed at once on the addition of 0·08 of dilute sulphuric acid.

Organic Acids.—The action of organic acids, though not so sharp as that of the mineral acids, is as clear as with most of the indicators in use.

With 1 ounce of water and 5 drops of test liquor, a small fraction of a grain of tartaric or citric acid sufficed to develop the pink colour. One drop of B.P. acetic acid produced the change, but 1 drop of vinegar strength did not produce a pink colour, though there was a change in that direction. In the liquor thus tinted by acetic acid, $\frac{1}{100}$ of a grain of sulphuric acid at once developed the pure pink colour.

Bicarbonate of Lime.—Water tinted pink in this way is very sensitive to ordinary hard water, and might probably give a fair approximation to the degree of temporary hardness in a water free from alkalies.

Chloride of Zinc produces no change of colour.

Corrosive sublimate causes a tinting towards pink, which is removed by the addition of chloride of ammonium.

Boracic Acid causes no change.

Cream of Tartar gives a tinting towards pink which is not much altered by small additions of caustic potass, or by tartaric acid, nor even by small additions of hydrochloric acid, until the addition probably left some free hydrochloric acid in the solution.

Hydrocyanic Acid produces no change even when present in nearly full pharmacopœia percentage, but the addition of a fraction of a drop of dilute hydrochloric acid developed the pink colour in a solution containing more than a drachm of the B.P. hydrocyanic acid.

Arsenious Acid has no action on the colour even on boiling for some minutes with the reagent.

Sulphurous Acid in small quantity produces the red coloration and does not bleach it when added in large excess.

Superphosphate of Lime does not cause reddening unless there is more phosphoric acid present than is requisite for retaining the lime in solution.

The PRESIDENT said that Mr. Proctor's second paper would be read before taking any discussion.

NOTE ON A COMMERCIAL SAMPLE OF LIQUOR OF IODIDE OF IRON.

BY B. S. PROCTOR.

If I had had a vote in establishing the laws of nature, I should probably have arranged that ferrous iodide should not have a propensity to absorb oxygen, liberate iodine, or behave in any other unsightly way on our shelves, and so I should have earned the thanks of all good pharmacists.

There has been evinced in our body a chronic desire to circumvent the nature of iodide of iron; and every now and then we have been promised by some maker, or some one who has devised a new formula, that we should at last be relieved of the hitherto troublesome changeability of iodide of iron or its syrup.

To my mind it does not appear probable that the *same* material should possess different properties when made by different processes, and if it were possible to obtain the same material endowed with different properties by deviating from the B.P. process, I should say that deviation ceased to be legitimate.

Holding these views I have not been very prone to accept the unchangeable iodides, but in a weak moment I was tempted to buy a little "Liq. Fer. Iodidi," which I was assured by the maker was not prone to darken, and could be made into a syrup of full Pharmacopœia strength by mixing with simple syrup as wanted; and which I was also assured I might examine as I liked and would find nothing but the legitimate iodide of iron and water.

I noted his words and concluded that it contained some preservative which he felt safe to promise me I should not find; perhaps he counted on my not carrying out my suggestion to examine it.

The first thing I noted was that it was freely acid, it not only reddened litmus more than solution of iodide of iron made by the B.P. process, but it also reddened methyl orange (sulpho-benzene-azo-dimethylamine) which is not acted upon by pure iodide of iron.

Sulphuretted hydrogen, when passed through the liquor, caused no change except the slow precipitation of white sulphur, which would result from the presence of a small quantity of a ferric salt, or a little sulphurous acid. The same reagent produced a small

black precipitate, with the pure neutral solution of iodide of iron. The commercial liquor was free from odour of sulphurous acid and from appearance of oxidation. The reaction suggested that oxidation might have been masked rather than prevented. It also suggested that the ferric salt, if present, might be the oxalate, which is green and of such a pale tint as not to be visible in the blue-green of the iodide.

As a check to this surmise a little ferric oxalate was added to a portion of liquor of iodide of iron, and it developed a little yellowness which again disappeared on heating with a little free oxalic acid, the original blue-green colour being restored.

I do not find, however, that oxalic acid has any specially protective power.

The presence of a little sulphurous acid, too small in quantity to be readily detected either by odour or reagents, would probably account for all the unchangeableness noticed, but would not account for the acidity of the liquor.

Phosphoric acid, having a reputation of preserving the presentable appearance of the liquor, was also sought for, and its presence proved by separation as ferric phosphate, and confirmed by precipitation as ammonio-magnesium phosphate.

After most of the experiments had been tried, I noticed a small precipitate at the bottom of the bottle, which had previously escaped my notice from the dark blue colour of the glass.

This precipitate, removed and washed, proved to be ferrous oxalate, as its lemon-yellow colour at first suggested.

Half a fluid drachm of the liquor, precipitated with nitrate of silver, indicated gravimetrically 13·47 grains iodide of iron, instead of 17·2, which was required to make a full strength syrup when the liquor was used according to the directions accompanying it.

A trace of sulphuric acid was found, but only such as might represent a little hard water, or the product of the oxidation of sulphurous acid. A trace of hydrochloric acid also, but too small to have any significance.

I do not profess that this is an exhaustive examination of the sample; my object was gained when I ascertained that its permanence was not the result of purity, not attained without a sacrifice of purity. I do not suggest the propriety of adding any foreign matter as a preservative. I have not even suggested the impropriety of such a course; but I do suggest that if any pharmacist feels himself impelled to any other expedient than that of keeping his solution in contact with an iron wire, he had better

at least know what he is doing. Add the adulterations yourself rather than buy the liquor ready adulterated and not know what it contains.

The PRESIDENT, in proposing a vote of thanks to Mr. Proctor, said there had been so much said and written on the subject of solutions of iodide of iron that he need not say anything to stimulate discussion upon it. This last note on methyl orange as an indicator seemed particularly useful, and it would be well if they had a similar series of experiments made with phenol-phthalein. Litmus really seemed to have too much its own way in this matter of acid and alkaline reaction; they had been using the terms acidity and alkalinity for so many years that they had got into the way of thinking that those were definite properties of a substance, whereas really all they were doing was speaking of the qualities of that substance in terms of litmus. He did not see why they should not speak of them in terms of phenol-phthalein or of methyl orange. If they did so they might even get nearer to truth respecting acidity, alkalinity, and neutrality.

Mr. EKIN said the use of these bodies as indicators was first brought into notice in this country by Dr. Witt some years ago. He advocated the use of what was known as tropœoline O.O., which had very much the same chemical composition as methyl orange, the methyl being replaced by the phenyl group, and it was more stable. Professor Lunge, in the article in the *Chemical News* referred to, had claimed that methyl orange was more delicate as an indicator, which was doubtful, and one of his statements that it was not affected by acetic acid, as Mr. Proctor had shown and he could confirm, was decidedly erroneous. He had sent Mr. Proctor a sample of Tropœoline O.O. to try against the methyl orange, and he had heard from him that he had not had time to try it properly, but he fancied it gave a purer red with acid and purer yellow with alkali, but was not quite so delicate.

Mr. FLETCHER said no meeting of the Conference could be considered complete without the question of iodide of iron coming up, and when he saw Mr. Proctor's paper on the list, he had the curiosity to turn up some old volumes of the *Pharmaceutical Journal*, and in ten minutes he counted no less than forty-two papers on the syrup and liquor of iodide of iron. Dr. Thompson, in 1834, first suggested iodide of iron as a medicine, and, rather curiously, it was introduced first as a liquor. It was made official in the old Edinburgh Pharmacopœia, the strength being that of

the present syrup, viz. 4·3 grains of ferrous iodide to the fluid drachm. In 1836, Mr. Squire, for even then this solution did not seem to have been quite immaculate, suggested that when dispensed it should be sent out with a coil of iron wire traversing the whole length of the solution. In 1842, Dr. Thompson read a paper at an evening meeting of the Society, when Mr. Savory was in the chair, and he seemed to have thrown cold water on the suggestion, for he said that having prescribed the solution of iodide of iron for a lady patient, she gravely wrote to ask him whether the iron screw which the bottle contained was to be swallowed whole, or taken in parts after each dose of the mixture. Dr. Thompson then recommended the syrup of iodide of iron, and suggested the very formula which has remained without alteration to the present time. He (Mr. Fletcher) had noticed that whenever this question came up, some gentleman always rose and said he was surprised that there should be any bother about making syrup of iodide of iron; that he was always able to make it perfectly colourless, and keep it. The very fact that such a number of papers had appeared in the Journal upon it, was pretty good evidence that the majority did not find it satisfactory. He felt a little delicacy in offering any remarks on Mr. Proctor's paper, partly because that gentleman was a much more experienced pharmacist than he was, and he also feared that as a manufacturer of iodide of iron his remarks might be misinterpreted; still he should like to say a word upon it purely from a chemical point of view. If there was one thing about making iodide of iron, which he had hoped had been thoroughly settled, it was that when iodine and iron were brought together in the presence of water hydriodic acid was developed. That had been proved to demonstration over and over again, and if the solution were distilled very large quantities of hydriodic acid might be got from it. If iodine and iron were boiled together in water, and the solution afterwards boiled up with more iron, there would be very brisk effervescence, which showed that there was free acid in the solution. That could be proved by distilling and precipitating the hydriodic acid as a silver salt. Mr. Proctor took exception in the first place to the solution because it was very acid; but he was open to challenge Mr. Proctor, or any other pharmacist, to make any solution of iodide of iron which should not be very acid when tested; at all events he would challenge him to make one which would not contain hydriodic acid. Then Mr. Proctor said he found ferrous oxalate. The wholesale druggists and manufacturing chemists had not had a very good time of it at this Conference, but he

really thought that no manufacturing chemist or wholesale druggist would have the hardihood to introduce such a poisonous substance as oxalic acid into a medicinal solution, if he had any reputation he cared to lose. With regard to sulphurous acid, he would only say that if any one wanted to try and keep a solution of iodide of iron by sulphurous acid, he had better try it; it would give a thick muddy deposit, and do all sorts of other disagreeable things. The suggestion of preserving the solution by phosphoric acid was due to an ex-President of the Conference, Mr. Groves, some years ago, and at the Swansea meeting, he recollected an admirable little paper, by Mr. Groves also, in which he suggested that if coloured syrup of iodide of iron were treated with a few drops of liquor potassæ, the colour would disappear, and if a little phosphoric acid were then added it would keep very well; and he concluded with the very sensible remark that of two evils he preferred to choose the lesser. He could not help regretting that Mr. Proctor was not present to answer any questions. He did not make any mention of the specific gravity of the liquor, which was in itself an indication of its strength. Further than that, he said that he separated phosphoric acid as ferric phosphate; but if phosphoric acid were really there, and he had a ferric salt there, he should imagine the ferric phosphate would already have come down. Mr. Proctor maintained, in the early part of the paper, that it was illegitimate to add anything whatever to a pharmaceutical preparation, whether it was faulty or perfect; but he recollected, at the London meeting of the Conference, Mr. Proctor read a paper on hydrocyanic acid, wherein he recommended the addition of some mineral acid to preserve it, and at another meeting, Mr. Williams recommended the addition of glycerine. The question for pharmacists was whether they should send out syrup of iodide of iron of all sorts of colours, or whether they should modify the process, as it was evident the Pharmacopœia never intended to have hydriodic acid present, and send out a preparation, which was always perfectly white and good, and which no one could complain of.

Mr. Williams said his recommendation was not that glycerine should be added to hydrocyanic acid by chemists without authority, but that it might be added as a preservative by the authorities of the Pharmacopœia. He never presumed to say that a chemist should add glycerine on his own responsibility.

Mr. Fletcher said in the course of the paper he referred to, he believed Mr. Williams said that no chemist, whoever he was, would be able to make hydrocyanic acid to keep without the

addition of some trace of mineral acid, and in the place of mineral acid he recommended glycerine.

Dr. SYMES said Mr. Fletcher had rather sat on those chemists who had said that syrup of iodide of iron by the Pharmacopœia process could be made to keep without some preservative being added to it; he happened to be an individual who, on more than one occasion, had said that. He did not believe even in Mr. Proctor's suggestion of adding iron wire. The syrup properly made and put in small, well-filled, stoppered bottles, exposed to a strong light, kept well. A liquor which kept well under almost any conditions was an undoubted convenience to many chemists, and deserved to be appreciated, but the syrup prepared from it and that by the Pharmacopœia process should not differ.

Mr. PARKER wished to say one word in support of Dr. Symes. He had in his possession a specimen of syrup of iodide of iron, prepared according to the British Pharmacopœia, which had remained unaltered for two years and a half. The only precaution he took was to fill the bottle so as to entirely exclude air. To his mind the use of a "liquor" was, in many cases, very convenient, but he doubted whether it would be so in the case of this syrup, where the difficulty in dispensing small quantities, say a drachm, or half a drachm, would be very much increased if one-eighth the quantity had to be measured. The only excuse he could see for a pharmacist using liq. ferri iodid. for the preparation of the syrup was from his being unable, or finding it very inconvenient, to prepare and store the syrup properly.

Professor TICHBORNE quite agreed with the remarks made by the last speaker. In giving a history of the syrup of ferro-iodide, Mr. Fletcher was not quite correct in some respects. As far as he recollected the history of syrup of ferro-iodide, the first improvement suggested was the use of iron wire, which he (the speaker) strongly objected to, as he did not think the wire preserved it at all. The next improvement was suggested by himself, many years ago, in a paper read at Bloomsbury Square. In that paper it was pointed out that up to that day the proportion of sugar was not sufficient; by the formulæ used up to that date a very thin syrup was produced, and one of the essential points of his (the speaker's) paper was to propose that the ferro-iodide should be run into a supersaturated syrup. Such a syrup, according to his experience, kept perfectly well. Hydriodic acid was formed in making iodide of iron in the first instance, but the amount formed would depend a great deal on the boiling, and the error which was implanted

in the student's mind by the direction of the Pharmacopœia was that he did not boil the iodide of iron enough. The direction was that when the yellow froth became decolorized the iodide of iron was supposed to be formed. That, however, was not a measure of the completion in the operation, and there was no doubt at that stage a considerable amount of free hydriodic acid present. If the boiling were continued for a considerable time the hydriodic acid would be brought down to a minimum, and that was one of the secrets which made the difference between a well prepared and a badly prepared syrup.

The next paper read was a—

REPORT ON THE STRENGTH OF COMMERCIAL SAMPLES OF TINCTURE AND LIQUID EXTRACT OF OPIUM.

By John Woodland, F.L.S., F.C.S., etc.

Having, during the past year, made several determinations of the strength of different samples of these two preparations of opium, I submit a compilation of the results of these and other estimations in the form of a paper to the members of this Conference.

From the variation in strength of the samples of opium used in pharmaceutical operations, a divergence in the results was anticipated and experienced, and in the present state of pharmaceutical progress such variation ought not to exist, and might be remedied.

Regarding morphia as the chief of the active ingredients of opium, and the assaying of this alkaloid an operation attended with no very great difficulty, I do not see why the samples, as they are wanted for use, should not be estimated, and having an official standard of say 8 or 10 per cent. (one or the other) of morphia, a mixture of the various samples made, which would bring the whole to this standard.

Many samples of best Smyrna opium contain 12 or even a greater percentage of this alkaloid; in such a case allowance could be made for the excess over the standard; for instance, a sample of opium is found to contain 12 per cent. of morphia, and a gallon of tincture is required; if the standard be 8 per cent. and the proportions of drug and spirit the same as now exist in the Pharmacopœial formula, 12 ounces will be necessary; but in the present case, 12 per cent. being contained, either a gallon and a half can be made with 12 ounces of this opium, or 8 ounces can be used to prepare a gallon.

It may be urged that the other principles contained in opium are of physiological value in the administration of the tincture, and therefore they ought to be estimated as well; but whilst their number is so great, and isolation tedious, I do not see that it would be practicable, the estimation of morphia only being sufficient for all practical purposes. The following is a table of the percentages of solid residue and morphia obtained from fourteen samples of tinct. opii procured from both London and provincial chemists:—

No. of Sample.	Character of Residue.	Percentage of Residue.	Percentage of Morphia.
1	Resinous	4·35	·62
2	Ditto	3·21	·41
3	Ditto	3·93	·45
4	Oleaginous	4·81	·38
5	Resinous	4·22	·61
6	Ditto	4·51	·59
7	Ditto	5·01	·68
8	Ditto	3·56	·32
9	Ditto	3·41	·45
10	Ditto	4·67	·70
11	Ditto	3·82	·51
12	Oleaginous	5·11	·41
13	Resinous	4·28	·65
14	Ditto	4·54	·69

The samples were evaporated at a temperature of 70° C. in an air-bath, and when perfectly dry treated by a modification of Prollius's method for the estimation of morphia, as follows: The solid residue was taken up with ten times its weight of equal parts of rectified spirit (60 over proof) and water, to this solution enough liquid ammonia was added to render it strongly alkaline, and then an equal bulk of ether was introduced, and having well shaken the mixture, it was set aside for twenty-four hours, after which the crystalline morphia was collected, washed with ether, dried and weighed.

One or two blank experiments were made with a known quantity of morphia in solution, by which the accuracy of this method was demonstrated, the difference between the quantities introduced and estimated being extremely slight.

Allowing that the opium from which the tincture is made contains the maximum percentage of morphia mentioned in the Pharmacopœia, viz. 8, the percentage of this alkaloid in the tincture will be about ·6, hence in six of the samples examined an over percent-

age was found, whilst in eight a deficiency existed, the lowest being No. 8.

Ten samples of liquid extract of opium were treated in a similar manner to those of the tincture, viz., evaporation to dryness, and the subsequent estimation of morphia in the residue. The following table indicates the results :—

No. of Sample.	Percentage of Residue.	Percentage of Morphia.
1	4·47	·37
2	3·39	·21
3	4·45	·30
4	4·71	·36
5	3·11	·19
6	3·40	·23
7	4·92	·37
8	4·21	·31
9	3·85	·21
10	3·02	·22

On calculation it will be found that if a sample of opium contains 8 per cent. of morphia, the liquid extract made from this sample should contain ·38 per cent. of this alkaloid, but in each of the above instances the percentage was too low, especially in the cases of Nos. 2, 5 and 9.

The PRESIDENT, in proposing a vote of thanks to Mr. Woodland, said this paper opened up the question of drug standards, which was rather a large subject. The percentage of morphia, indicated in the Pharmacopœia, which should be contained in opium was not 8 per cent., but from 6 to 8 per cent., but even assuming it was 8, it was rather curious that these samples of tincture should yield on the average apparently within 10 per cent. of that quantity, while the liquid extracts did not yield enough morphia by 25 per cent. It would seem as if the opium were very poorly extracted in the case of the solutions.

Mr. PLOWMAN said it would be useful to know on what data Mr. Woodland proceeded when he said, on calculation, it would be found, if crude opium contained 8 per cent., the liquid extract ought to contain ·38 per cent of morphia. It could not be the same in every case.

The last paper read was a—

REPORT ON THE PURITY OF COMMERCIAL SAMPLES OF SILVER SALTS.

By John Woodland, F.L.S., F.C.S., etc.

I was led to make the following analyses partly by seeing on the green paper issued by the Conference Committee that such a report was wanted, and partly on account of curiosity, awakened by seeing various sized caustic points sold for the same price, and after obtaining a large caustic point for a small piece of money, came to the conclusion that the maker, fearing that the caustic point might prove too strong, with due regard to the tender feelings of the public modified its action by the aid of a diluent. The diluents found in the two forms of nitrate of silver, viz. caustic points and crystals, were the nitrates of potash and soda, those of potash being chiefly present, as the following table will show:—

Caustic Points.

No. of Sample.	Percentage of $Ag\,N\,O_3$.	Name of Diluent.	Percentage of Diluent.
1	63	Potassium Nitrate . . .	36
2	71	Sodium ,, . . .	26
3	64	Potassium ,, . . .	35
4	75	Potassium ,, . . .	25

Crystals of Silver Nitrate.

No. of Sample.	Percentage of $Ag\,N\,O_3$.	Name of Diluent.	Percentage of Diluent.
1	89	Potassium Nitrate . . .	10
2	99	None	—
3	92	Potassium Nitrate . . .	8
4	84	Sodium ,, . . .	14
5	80	Potassium ,, . . .	19
6	100	None	—

In the estimation the points and crystals were reduced to powder and dissolved in recently boiled distilled water, to which a standardized solution of pure cyanide of potassium (prepared from an alcoholic solution of K H O) was added until the precipitated

cyanide of silver at first formed was exactly dissolved, the data being derived from this equation—

$$2\,KCN + AgNO_3 = AgCN, KCN + KNO_3$$

It may be noticed that the above figures do not in every case aggregately come to 100, the deficiency in number being due to a slight amount of moisture present. Crystals of nitrate of silver when pure are transparent, and an impurity can usually be told by its giving a translucent appearance, and so causing them to somewhat resemble the crystals of chlorate of potash. The impurities in the above samples were estimated by precipitating the silver as chloride with hydrochloric acid, filtering, and evaporating the filtrate and weighing the residue.

The other salt of silver estimated was the oxide, most samples of which had been in stock for some time. Six samples furnished the following table:—

No.	Percentage of Silver.	Corresponding Percentage of Oxide.	Impurities.	Percentage of Impurities.
1	76	81	Carbonate and Chloride of Silver.	19
2	70	75	Siliceous matter	25
3	81	87	Carbonate and Chloride of Silver.	13
4	72	77	Ditto	24
5	78	83	Ditto	17
6	69	74	Ditto	26

The samples of oxide were estimated by dissolving in nitric acid, precipitating with hydrochloric acid, washing, fusing, and weighing the residue. The presence of carbonate and chloride with the oxide of silver seems to indicate that either solution of potash or soda is used in its preparation, instead of lime water as officially ordered, as carbonate and chloride are to be found in both of these solutions. The siliceous matter is undoubtedly an intentional adulteration.

The President, in proposing a vote of thanks, remarked that caustic points did contain nitrate of potassium, because nitrate of silver was too brittle to be used alone in the small cases. He believed that all makers put in some nitrate of potassium. Crystals of nitrate of silver certainly should not contain potassium or sodium nitrate or chlcrate of potassium either. As for the oxide there

could be no doubt that if precipitated with the common soda it might contain carbonate, but not if precipitated with pure soda.

Professor QUINLAN said the addition of potassium nitrate to pencils of nitrate of silver was perfectly recognised and necessary. Nitrate of silver of itself was too brittle, particularly when applied to the throat and parts where it would be liable to drop down. It was a great advantage to the practice of surgery to have these neat little points, compared to the trouble of grinding away with a wet cloth at a stick of nitrate of silver, which the surgeon used to have to do before the points were brought into the market. He need not say that nothing would justify the addition of extraneous matters to silver nitrate crystals.

Mr. MASON said he did not know whether Mr. Woodland stated the source from which he obtained some of these samples, but he did not think it possible that such nitrate crystals came into the hands of chemists and druggists. Photographers were in the habit of buying up waste from which they recovered nitrate of silver, and probably some dealers in photographic chemicals might be tempted to adulterate it in this way. Respecting the oxide of silver, he believed as a matter of fact it was not sold pure, for being in want of some absolutely pure some months ago, he wrote to a large manufacturer for it, who replied that he should have to make it for him. He ultimately received a small quantity in a moist state, and was told that he could not be supplied with it dry.

Professor TICHBORNE said oxide of silver was a pharmaceutical preparation, and there should be no difficulty in procuring it at any house, retail or wholesale.

Mr. WILLIAMS said the tough nitrate of silver, made specially for surgical purposes in points, contained as a rule nitrate of lead, not nitrate of potash, as the former toughened it much more than the latter. It was not put in as an adulteration, and was allowed for in the price charged for the article. It was a special thing, known as toughened nitrate of silver, at least so he understood, for he did not make it himself. He was certainly very much astonished to hear of the impurities found in the crystallized nitrate of silver. He had had a great deal of experience in this article for many years, and knew it was not always pure, and the commercial article was not as pure as it might be; but it could be purified, and was all the better for being recrystallized and purified again and again. Still he did not imagine that the impurity was above $1\frac{1}{2}$ or 2 per cent. at the most, and he did not believe any photographer would

purchase an impure nitrate of silver; photographers knew perfectly well what nitrate of silver should be, and would not purchase it twice if it were impure.

Mr. NAYLOR said he had examined commercial nitrate of silver by means of a standard solution of chloride of sodium on various occasions, but had not found it to contain more than $1\frac{1}{2}$ to 2 per cent. of impurity.

Mr. ANDREWS said that after the remark made about oxide of silver, which, to the dispenser, was of even greater importance than the nitrate, he was in hopes that some of the practical manufacturing chemists would say whether there was such an amount of impurity as was stated. It was a powerful remedy when used in small doses, and if adulterated to such an extent it would be a very serious matter. Mr. Woodland said the oxide of silver in commerce generally contained a certain quantity of chloride. It was perfectly certain that pure caustic soda, absolutely free from chloride, was never used in practice for precipitating the oxide, and, therefore, as the caustic soda would contain a percentage, not very large, of chloride, so the oxide of silver would probably contain a little chloride too. That would explain why Mr. Mason could not obtain chemically pure oxide of silver except by special order. The idea of throwing it down by lime water, which was suggested in the paper, was one which was not recommended in any works on the subject, although of course it would be very effective. The difficulty was that the lime water held so small a quantity that it would take a large bulk of water to effect the object.

Professor TICHBORNE said the lime water was the Pharmacopœia process.

Mr. GROVES said on one occasion the presence of carbonate in oxide of silver was manifested to him by the swelling and effervescence of some pills that he was making. The oxide of silver became reduced to the metallic state, carbonic anhydride was given off, and the pills became very large. On examining the specimen of the oxide, he found it contained a large proportion of carbonate.

CLOSING BUSINESS.

Place of Meeting in 1883.

The President said the next business before the Conference was to appoint a place of meeting for the year 1883. Usually the Committee had been able to announce that the British Association would meet in such and such a town, and it had been the practice for the Conference to meet in the same place. On this occasion, however, this could not be done, because Oxford, which was the place chosen by the British Association for 1883, had sent word to that body that owing to some unforeseen circumstances it would not be able to entertain the British Association next year, and it was not at that moment decided where the British Association would meet. A question might arise whether the Conference should necessarily meet in the actual town in which the British Association met, but unless it really was important to go into that question, he hoped it would not be raised. It was quite a distinct question, the Committee decided it a year or two ago, and for the present, at all events, it was undesirable to alter the rule of meeting where the British Association met. That practice had been carried out with one single exception, which was perfectly justifiable, ever since the Conference was formed. He held in his hand an invitation from the Oxford chemists which was everything the Committee could wish, but he would suggest that the members should leave it to the Committee to decide at an early meeting where the Conference should meet in 1883.

Mr. Grose (Swansea) then moved that the place of meeting for 1883, and the selection of local officers, be left to the Executive Committee.

The motion was seconded by Mr. Deane and carried unanimously.

Officers for 1882–83.

The Conference then proceeded to elect the officers for the ensuing year, Messrs. Robinson and Clark (York) being appointed scrutineers of the ballot papers.

The following officers were unanimously elected :—

President.—Prof. Attfield, Ph.D., F.R.S., F.I.C., F.C.S.

Vice-Presidents.—M. Carteighe, F.I.C., F.C.S., London; J. R. Young, Edinburgh; C. Umney, F.I.C., F.C.S.

Treasurer.—C. Ekin, F.C.S., Hounslow.

General Secretaries.—F. Baden Benger, F.C.S., Manchester; S. Plowman, F.I.C., London.

Other Members of Executive Committee.—Alexander Kinninmont, F.C.S., Glasgow; J. C. C. Payne, Belfast; W. A. H. Naylor, F.C.S., London; R. Chipperfield, Southampton; P. W. Squire, F.L.S., F.C.S., London; G. S. Taylor, F.C.S., London; J. C. Thresh, D.Sc., F.C.S., Buxton; F. W. Fletcher, F.C.S., London.

Auditor.—James Spearing, Southampton.

Votes of Thanks.

Mr. Williams said it was with great pleasure he rose to propose a resolution, which he was sure all present would cordially agree with. It was one proposed every year, and it would be almost impossible to find fresh language proper to such an occasion; but fortunately it was not necessary that much should be said. He was quite sure the gentlemen on whose behalf he was going to move the resolution would take his words as expressing the very cordial feeling which the meeting had towards them. It was—

> "That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the Local Committee and especially to Messrs. Randall, Chipperfield, and Dawson, for the very successful manner in which the various arrangements connected with the Southampton visit have been carried out."

He would not add one single word, except to say that he considered the meeting had been an exceedingly good and successful one.

Mr. Giles seconded the motion with very great heartiness. He said the pleasure they had all felt in receiving the hospitality and attention of the local members had been greatly enhanced by the courteous personal attention they had received at the hands of those gentlemen who had been named. He and many others met an old friend in Mr. Randall, whom he was glad to see as Chairman of the Local Committee. He had had great pleasure in meeting Mr. Chipperfield and making his acquaintance, and he could not help saying, as a good many others felt, that he regretted that it should be necessary on these occasions to have a Treasurer at all, whose duties must be somewhat severe. They could not help feeling while they were receiving such friendly attention they were also imposing considerable liabilities on their friends, who so kindly and cordially entertained them; but these things could not be helped, and he only trusted that those gentlemen received some satisfaction from them, as they were told, on the highest authority, that it was more blessed to give than to receive.

The motion was carried unanimously.

Mr. RANDALL, in reply, said it was very common to say that one felt more difficulty in speaking on such an occasion than on almost any other, and it was perfectly true; but he might be allowed to say that the members of the Local Committee were greatly obliged to all the members of the Conference for the kind way in which they had received all their efforts and overlooked their shortcomings. When a thing of that sort had to be done just for once, no one could do it so well as if it had to be done frequently. Southampton could not say, as York said through its representative, standing in the position he now occupied, that it was essentially a city of the past; it could not aspire to be a city at all, and it would not wish to look back; if it could it would rather be an aspirant to future progress. Southampton burst its stone bonds, of which they saw the relics in the gates and some of the walls, about the seventeenth century, and went out into the open, and had been going on increasing ever since. It was only that year that Southampton burst what they considered a very serious iron bond, and was now looking forward to the north to help them by coming down more readily, as it would have two ways instead of one of doing so, and assisting by its enterprise and commerce and science too. He believed science now-a-day did more to help commerce and enterprise than it ever did before. The pharmacists of Southampton, of course, hoped that they would participate in the general improvement in commerce, which they looked for as these things went on, and he heartily thanked the Conference for giving them some hints at least towards improving pharmacy as an art, and especially as a science. If, therefore, the visiting members had received a little hospitality in that which was material, they in the district had gotten a great deal more in that which was far better, which he hoped they would make use of in the future. In the name of the Local Committee he begged to express their high appreciation of the way in which their endeavours to promote the comfort of the visitors had been received.

Mr. CHIPPERFIELD said he was no orator, or else perhaps he might express himself in such a manner as would startle the meeting. He was a bad hand at whistling, and was especially disinclined to attempt whistling before he was through the wood, and they had still to look forward to the morrow. He was happy to believe that they were satisfied that the local chemists had been doing what Nelson told his sailors England expected them to do,—they had striven to do their duty. *A propos* of what Mr. Randall had said,

he might add that he had felt very strongly indeed during the last twelve months the truth of the poet's lines which he learnt in his youth,—he had not read much of that author's poetry in his maturer years,—that—

> "A man must serve his time to every trade,
> Save censure; critics all are ready made."

His share of this work had been done during his apprenticeship, and the same with his *confrères*, and the shortcomings which no doubt had been noticed and would still be witnessed must be placed to that account. He felt that by the next night he should have thoroughly served his time at this business, and that if they could only persuade the Conference to come again next year, they should then be able to do the work well; at any rate he believed he should do his part then perfectly. At present he could only say he had done it to the best of his ability.

Mr. DAWSON also thanked the Conference for the acknowledgment which had been given for the slight trouble he had taken and the services he had been able to render to the gentlemen attending the Conference. When the matter was first mooted, it was with considerable fear and trembling that he took the office of Local Secretary, but since then he had scrupulously attended to all the minor details he possibly could, with the view of rendering their visit as pleasant and comfortable as possible. He hoped the gentlemen attending the Conference would carry away with them as pleasant reminiscences as the pharmacists of Southampton would retain of the visit of the Conference.

Mr. CHIPPERFIELD asked leave of the President to add a word or two which a sense of duty compelled him to utter. He hoped no one would go away and fancy that the hospitality they had received, and would still receive, came exclusively from Southampton. They had to thank almost every town in the county for its kind assistance, and also several gentlemen residing in other places, such as Salisbury, London, Redhill, Cheltenham, Shepton Mallet, and elsewhere. He mentioned this so that any town which perhaps might be as poor as Southampton, and might, therefore, not be able to entertain the Conference, might follow the example of Southampton, and gain that extraneous aid which would enable them to do the same as had been done for seventeen or eighteen years.

Professor TICHBORNE said they would all feel that this was what might be termed in the annals of the Pharmaceutical Conference, a red letter meeting, and, individually, he should take this oppor-

tunity of thanking the local gentlemen for the reception they had given him as a stranger amongst them. The success of that meeting so far had been perfect, and although they felt deeply indebted to the local men for that success, they knew also that it was almost impossible, even for local men, to make these meetings successful, unless they had support from the authorities and other general assistance. Everybody who had been at the Ordnance Survey Office must have felt that it was a great treat; in fact, it was an unique exhibition. He was informed that the zinco-lithography, which was now so universally used, to which they owed cheap music and many other things, was chiefly due to the Ordnance Survey Office of that town, that it was invented and perfected there. It therefore possessed a peculiar interest, and very properly the people of Southampton were very proud of it. It would be wrong, therefore, if they separated without passing such a resolution as he was about to move, namely—

> "That the best thanks of this Conference be given to Major-General Cooke, the Inspector-General of the Ordnance Survey Department, for his kindness in affording the members facilities for visiting the Ordnance Survey Office."

Dr. SYMES seconded the motion. He said every one who had visited the office and seen the processes employed would be impressed with the thoroughness of the work which was done there and the science which was brought to bear in carrying it out.

The motion was put and carried unanimously.

Mr ATKINS then moved—

> "That the hearty thanks of the members are due and are hereby tendered to the President for the courteous and very able manner in which he has conducted the business."

He said there was a danger that he might weaken the force of these well selected words by any ill-selected words of his own, but he could not allow the resolution to pass without expressing his own personal feeling with regard to it. He had been most solicitous, coming from a neighbouring city which could hardly venture to hope to have the honour of a visit from the British Association or the Pharmaceutical Conference, that this Southampton meeting should be a great success, and that desire had been amply met. He did not know that there had been the slightest thing to mar their enjoyment excepting a little wet weather; the room in which they had met, the admirably representative gathering of those assembled, and the character of the papers would all render the meeting

memorable. It was an important thing to have a good President and though he wished to make no comparisons, he ventured to say they had never had a better. Professor Attfield had this disadvantage, that he had a great reputation, and a man who had a great reputation had to work up to it, as a beautiful woman had always to keep up to the report of her beauty. Professor Attfield had excited great expectations, and he had realized them. He had given an address of which he ventured to say yesterday that the highest compliment he could pay to it would be that it would excite attention and possibly criticism. Besides that, there fell upon him in his office as President the duty of seizing the salient points of all the papers and presenting them in clear, accurate language to the meeting, and he need hardly say to do that required many gifts, large reading, and much knowledge. In addition to the address and in addition to presenting the points of the papers he had, with all the courtesy and consideration possible (barring that one matter of the vital force), allowed the widest latitude to discussion. They would all look back with pleasure to this Southampton meeting, no small part of the success of which was due to the fact that Professor Attfield had been President.

Mr. Stephenson had much pleasure in seconding the motion. As a delegate, with Mr. Borland, from the northern division of the United Kingdom, he could only say that as far as he was concerned he had felt it was his part to listen rather than to speak.

Professor Quinlan said it would not be fitting if no voice from Ireland were raised to support this resolution on an occasion when the Conference was presided over by a gentleman whose work on chemistry was the standard book in the Irish medical schools. This would be always regarded as a red letter meeting of the Conference, partly from the admirable way in which Professor Attfield had presided, and partly from the kind and generous hospitality received from the Southampton members, which none would ever forget.

The motion was put by Mr. Schacht, and carried by acclamation.

The President, in responding, thanked the members for the kind way in which they had shown their appreciation of his humble endeavours to fulfil the duties of President. The secret of his apparent success, and he must admit it had been a success, after what had been said, was chiefly that he had profited by the example of his predecessors, and not only his predecessors in that chair, but Mr. Stephenson and Mr. Atkins would allow him to say, of other Presidents and other Vice-Presidents also, connected with the Con-

ference and with the Pharmaceutical Society. He thanked his colleagues, the previous Presidents, for their kind support during this meeting, and he thanked all the other officers too, and he was sure the officers generally would excuse him if he especially thanked the Secretaries for their labours in carrying on the business of the sittings. He must also thank the authors of the numerous papers; they had seldom had a larger number of more practical papers. He must recognise, too, the kindness of so many gentlemen who had contributed to the discussion of the papers, and it was particularly gratifying to him to find amongst the authors of papers and the speakers so many of his old pupils. He was particularly pleased to have met them, and he thanked them for coming. He had been glad to meet at Southampton members whom he had not met before. He was particularly glad to have met so many of the friends he had made at the meetings of the Conference, during nineteen years, and including Newcastle, twenty consecutive years. He thanked the members very much for the kind way in which they had passed this resolution and, in conclusion, could assure them that he would do his best to promote the interests of the Conference during the coming year.

THE EXCURSION.

On Thursday, by the invitation of the Local Committee, a party proceeded on an excursion to the Isle of Wight. Any fears which might have been entertained during the storm which raged on the Wednesday night, as to the condition of the weather on the following day, were fortunately dispelled. The morning was faultless; the sun brilliant and the air delightful. Before half-past eight, the hour fixed for starting, members of the Conference were making a forced march to the pier-head, many, judging from an indescribable expression of "goneness" in their features, having evidently sacrificed breakfast to an heroic determination to be punctual. The steamer engaged for the trip was one of the finest boats in the Isle of Wight Company's service, and about one hundred and twenty excursionists, including a fair proportion of ladies, were on board when, a little before nine o'clock, the signal for departure was given. The run to Ryde was most enjoyable, affording as it did, glimpses of many objects of interest; Netley Hospital, with its magnificent façade, and the ruins of the fine old Abbey close by, well contrasted the spirit of the Past and the Present, and Osborne,

so delightfully situated amidst the peaceful beauty of its surroundings, evidenced the gentle spirit of its royal occupant.

Ryde was reached at 10.30, where a train was waiting to convey the party to Brading. Alighting here, a pleasant stroll through lanes and fields, rich in spoils for the botanist, brought the visitors to the remains of the Roman Villa. An inspection of the mosaic floors, some of which are in very perfect condition, and the many archæological treasures which have been turned up during the excavations, detained the company here until 12.30, when train was taken to Ventnor.

A short distance from the town, on the Bonchurch Road, a substantial luncheon was served on the lawn in front of the residence of Captain Roache, who had kindly thrown open his grounds for the reception of members of the Conference. The majority of the party then made their way through Bonchurch to the Landslip. The magnificent scenery of this spot is too well known to need description; suffice it to say that the expanse of sun-illumined sea on the right hand, and the solemn grandeur of the grey crags to the left, intermingled with the varied tints of the luxurious foliage, made up a scene which by those who witnessed it for the first time will never be forgotten, and which by those who had already seen it many times before will ever be remembered with increased delight.

On the road along the cliffs to Shanklin stands the private residence of Mr. Gibbs, of Ryde, and at this point a pleasant surprise awaited the excursionists. Mr. Gibbs, gracefully assisted by his wife, welcomed into his house successive detachments of the party as they arrived; and beneath his hospitable roof every kind of comfort and refreshment was set before them. In the dining-room were choice wines and fruits, and in the drawing-room, tea, coffee, and other light refreshments. Coming as it did so unexpectedly, and dispensed so courteously and generously, Mr. Gibbs' hospitality constituted one of the most delightful incidents of the trip.

After passing through the village of Shanklin and visiting its celebrated Chine, the party returned by rail to Ryde, and thence by steamer to Southampton, where, at 7.30, high tea was served at the Royal George Hotel. Numerous speeches followed, and at a late hour the company dispersed, unanimous in the opinion that a pleasanter excursion had never been spent by the Conference.

Amongst the members of the Local Committee singled out for special thanks were Mr. Randall, the courteous Chairman, Mr. Dawson, the assiduous Honorary Secretary, and last, but not least, Mr. Chipperfield, the energetic "Acting Manager."

INDEX.

M M

B.

C.

E.

F.

G.

H.

I.

J.

K.

L.

N.

O.

Q.

R.

S.

T.

U.

V.

W.

X.

Y.

Z.

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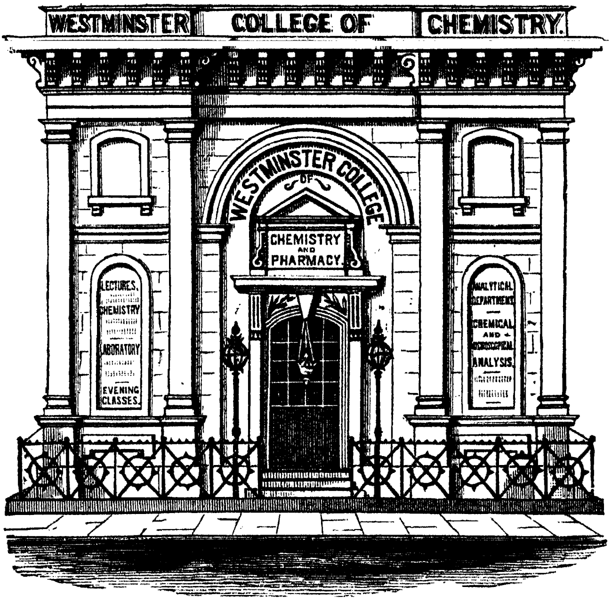

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Extract from "Pharmaceutical Journal" of May 1, 1856, *page* 486.

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON.
Wednesday, April 2nd, 1856.

"*On Pure Oxide of Zinc for Use in Medicine.*

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide had been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

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Toilet Waters and Perfumes Shipped in Bond at a great reduction.

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SOLE PROPRIETOR AND MAKER OF THE

PREPARED SILVERY WHITE GUTTA PERCHA ENAMEL

REGISTERED—NO. 8745. For Stopping Decayed Teeth.

SILVERY WHITE GUTTA PERCHA ENAMEL.—36 squares in a box, to retail at 1*d.* each; wholesale price, 1*s.* per box.
SILVERY WHITE GUTTA PERCHA ENAMEL.—On show cards of ½ gross, to retail at 1*d.*, at 6*s.* per gross.
SILVERY WHITE GUTTA PERCHA ENAMEL.—12 sticks in a glass-lid box, to retail at 3*d.*; wholesale price, 1*s.* 3*d.* per box.
SILVERY WHITE GUTTA PERCHA ENAMEL.—12 sticks in a glass-lid box, each stick enclosed in a gelatine or gilt case; wholesale price, 2*s.* per box.
SILVERY WHITE GUTTA PERCHA ENAMEL.—12 boxes on a show card, to retail at 6*d.* per box; wholesale price, 3*s.* 6*d.* per card in a box.
SILVERY WHITE GUTTA PERCHA ENAMEL.—In 1-oz. sheet, 12*s.* per doz.
SILVERY WHITE GUTTA PERCHA ENAMEL.—In 4-oz. sheet, 3*s.* 6*d.* each.

P. A. S. can supply the above to **Wholesale Houses,** *in any quantity, with their* **name stamped upon each piece,** *cut in sticks any length.*

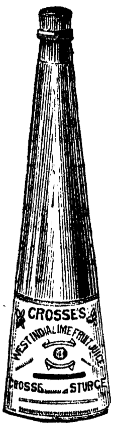
The above to be obtained of all Wholesale Houses. **Price List and Samples sent post free.**

SPECIAL NOTICE.—The words SILVERY WHITE GUTTA PERCHA ENAMEL are registered as a Trade Mark, and will be protected.

Crosse's Lime Juice Preparations

Obtained the Highest Award Manchester Exhibition, 1880.

NO MUSTY FLAVOUR. NO ALCOHOL.



CROSSE'S Lime Juice Cordial.

Specially prepared for Export. Entirely free from Spirit.

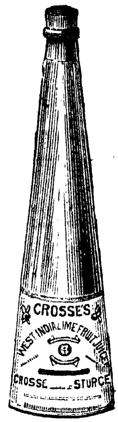
"For a delicious summer beverage commend us to CROSSE's Lime Juice Cordial."—*Civilian.*

CROSSE'S Assorted Fruit Syrups.

Black and Red Currant, Raspberry, Cherry, Strawberry, Pine Apple, Jargonelle, Orange, &c. Most agreeable and refreshing beverages, either diluted with water or alone, or blended with spirits.

CROSSE'S Winter Cordials.

Clove, Gingerette, Elderette, Peppermint, and Aromatic Cordial.



CROSSE'S Beverages

Are suited to all classes, to all seasons, and all climates.

CROSSE'S (late STURGE'S) West India Lime Fruit Juice.

Warranted pure, fresh, and undiluted, as recommended by the *Lancet.*

"No traveller steaming through the Suez Canal on his way to India should be without a supply of this beneficial and wholesome Lime Juice."—*British Mail.*

CROSSE'S (late STURGE'S) Ship Store Lime Juice.

Fortified with 15 per cent. of proof Rum, under the supervision of the Board of Trade and the Officers of H.M. Customs.

" A greatly superior article to the ordinary juice obtained from lemons."—*British Mail.*

CROSSE'S Lime Juice Sauce.

This Sauce is prepared from the pure Lime Fruit Juice, and will be found of exquisite flavour.

CROSSE (Successor to Sturge).

The first to introduce pure Lime Fruit Juice to H.M. Government. Established 1868.

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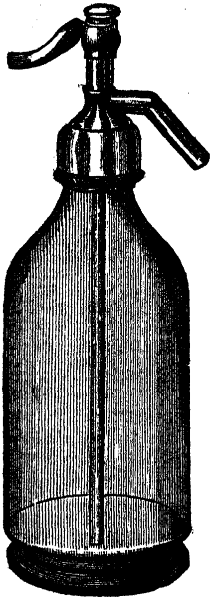
EUGENE GERAUT & CO.,

PATENTEES AND MANUFACTURERS OF



SODA-WATER MACHINES,

Filling Machines, Syphons, Seltzogenes, etc.

SYPHONS

In White, Amber, Blue, or Green Bottles. Made of Pure English Block Tin. Tops warranted free from Lead. Will retain their brilliant polish.

WHOLESALE PRICES.

Short Levers, 22/6 per dozen nett; Cap or Piston Tops.
Long Levers, 24/- per dozen nett; Cap or Piston Tops.
Nickel-plated Top, 3/- per dozen extra.
Strongly Silver-plated Top, from 8/- per dozen upwards.

Customer's Name Stamped on the Metal Tops free for One Gross.

Names and Trade Marks Ornamentally Engraved on the Bottles by the Acid Process, from 1½d. to 2d. each extra. Each Syphon thoroughly tested before being sent out.

SAMPLES SENT ON APPLICATION.

SODA-WATER MACHINERY, GENERATORS, WASHING VESSELS, AND GASOMETERS.

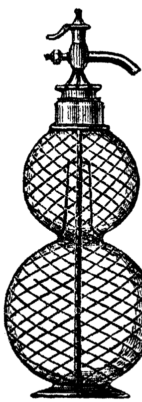
From £40 to £120 (See our Catalogue).

	£	s.	d.
Syphon Filler	4	10	0
Ditto, with Syruping Machine combined .	15	15	0
Bottling and Corking Machine	7	10	0
Ditto, with Syrup Dosing Machine combined	15	15	0

GUN METAL SYRINGE,

Strongly Silver-plated, for introducing Syrup into Syphons, 15/- each.

EUGENE GERAUT & CO.'S NEW PATENT LEVER SELTZOGENES,



For the immediate production of Eau de Vichy, Soda Water, Sparkling Lemonade and Aërated Waters.

WHOLESALE PRICES AS FOLLOWS:

	s.	d.		s.	d.		s.	d.
Three pint, wire	13	0	Five pint, wire	18	0	Eight pint, wire	30	0
Three pint, cane	13	6	Five pint, cane	19	0	Eight pint, cane	32	0

Three pint strongly silver-plated Tops and richly decorated Porcelain Stands, each 30/-
Five pint ditto, 38/-; Eight pint ditto, 48/-

IMPORTANT NOTICE.

For Orders of three we allow 15 per cent. Large discount allowed off quantities upwards.
Strongly silver-plated Top, 5/- each extra.

Powders for the above:

	12 charges. Per dozen boxes.		10 charges. Per dozen boxes.	
	s.	d.	s.	d.
Three pint size, in handsome labelled boxes	21	0	18	6
Five pint ditto ditto	30	0	26	0
Eight pint ditto ditto	51	0	44	6

Our well-known Seltzogenes are improved yearly, and have already stood a public test of upwards of Twenty Years, and are acknowledged as the VERY BEST.

BEST SYRUPS, warranted to be made of the choicest and finest fruits, specially prepared to be used with our Celebrated Seltzogenes, are supplied by us.

Illustrated Catalogue on Application.

OUR ONLY ADDRESS IS

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MACHINES FROM £30.

Sole Agents for **CODD'S PATENT SODA-WATER BOTTLE,** and Sole Manufacturers of the **LONDON-MADE SYPHON.**

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